Ditch
User Manual

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- No one is authorized to alter, modify or enlarge this warranty nor the exclusion, limitations, and reservations.

Safety

Safety Precaution-Remember, YOU are ultimately responsible for your safety and the safety of those around you!

- When working with or near these systems, please observe the following safety measures:

- Be alert and aware of surroundings. Do not operate machinery or systems under the influence of alcohol or an illegal substance. Remain in the operator's position and be in complete control at all times when systems are engaged.

- Determine and maintain a safe working distance from other machinery, equipment, obstacles, farm personnel, and people. The operator is responsible for proper disengagement of all systems once safe working distance has been determined.

- Know your software!! The DAC will only move as is called for by a controller package. The operator is required to know how his software package functions and when it could possibly send movement commands to the DAC controller.

Hydraulic Safety Requirements

- Machine must be off, isolated, and stationary while installation and maintenance is being performed. When disconnecting hydraulic hoses, be aware that the hydraulic oil within the system may be hot and under high pressure. **Caution must be exercised.**

- Any work carried out on the hydraulic systems must be performed in accordance with the equipment manufacturer's approved maintenance instructions. Rust Sales, Inc. recommends that appropriate protective equipment be worn while working on the hydraulic system.

- **Warning:** It is imperative that all hydraulic hoses are connected to the relevant components. Failure to connect the hydraulic hoses correctly will cause damage to the system.

Electrical Safety Requirements

- Do not reverse the power leads. Doing so will cause severe damage to the equipment.

- Always check to make sure the power leads are connected to the correct polarity.

- Ensure that the power cable is the last cable to be connected.

EULA Page 1 of 2

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Halstad, MN 56548

Setting GPS Receiver Output Data

1 Before starting SD Drain the GPS receiver being used must be set to output specific parameters. The next few pages show how to set parameters outputs for different GPS receiver brands.

GPS Settings that need to be set before connecting to SD Drain:

Baud Rate

Set at 57600 or 38400 (57600 is preferred)

NEMA Strings 3 Required

GGA — 10Hz or 5Hz (only use 5Hz if 10Hz is unavailable)
GSA — 1Hz
RCM or VTG (RCM is preferred) - 1Hz

John Deere 3000/ITC settings for SD Drain

Plug the 3000 or ITC Globe to a John Deere screen 2630, 2600, 1800, command center, or Brown Box.

Go to the Globe settings on the Globe

Change the Baud Rate to **57600** (38400 for ITC)

Set the HZ to **10** (5 for ITC)

Turn GGA, GSA & RCM "**ON**" (Make Sure ALL the rest are **OFF**)

Turn TCM (Tilt Control Module) **OFF**

Go back to home page and confirm the globe is getting RTK GPS. (Change tower network ID's if you need too)

Verify RTK GPS before powering down.

Power the John Deere screen completely off.

Connect Globe to SD Drain Cables and turn machine on.

1 Setting GPS Receiver Output Data

Trimble (262/252/372) Settings

Double Click on **Ag Remote** on the computer.
Select File and Connect then click **OK.**
Touch the right arrow until it displays **configuration**.
Touch the Down arrow until it displays **GPS Config**
Touch the down arrow until it displays **position rate**
Make sure it displays **10 HZ** (if it does not change it)
Touch the up arrow till **GPS Config**
Touch the right arrow until it shows **Port A**
Touch the Down arrow until it shows **NMEA 1**
Turn **GGA , GSA and RCM messages on** and touch the **enter** button
Touch the down button till it gets to **NMEA output rate**
Change the NMEA output to **ASAP**
Touch the **enter** button
Touch the up arrow till it shows **Port A in/out**

Change the screen to look like this

I - TSIP - 38.4k
O - 8N1 - NMEA - 38.4K

Touch the **enter** button and that will disconnect the GPS from AG remote. Exit Ag remote and start SD Drain

Note:
Confirm RTK is working on the Trimble receiver before changing settings. Change tower networks if needed.

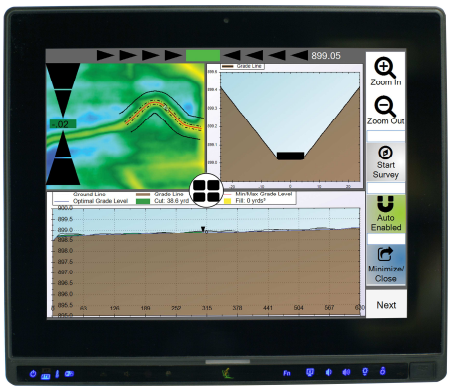
Confirm GGA, GSA and RCM are the only NMEA messages that is on in NMEA 1,2 & 3 (ON = All Capital letters in Port A Config)

Initial Program Set Up

The initial program setup has to be done once before using the SD Drain Ditch package. This initial setup is necessary to define user and equipment parameters and ensure proper connectivity to the gps receiver and automatic machine control modules.

Power on Control Computer

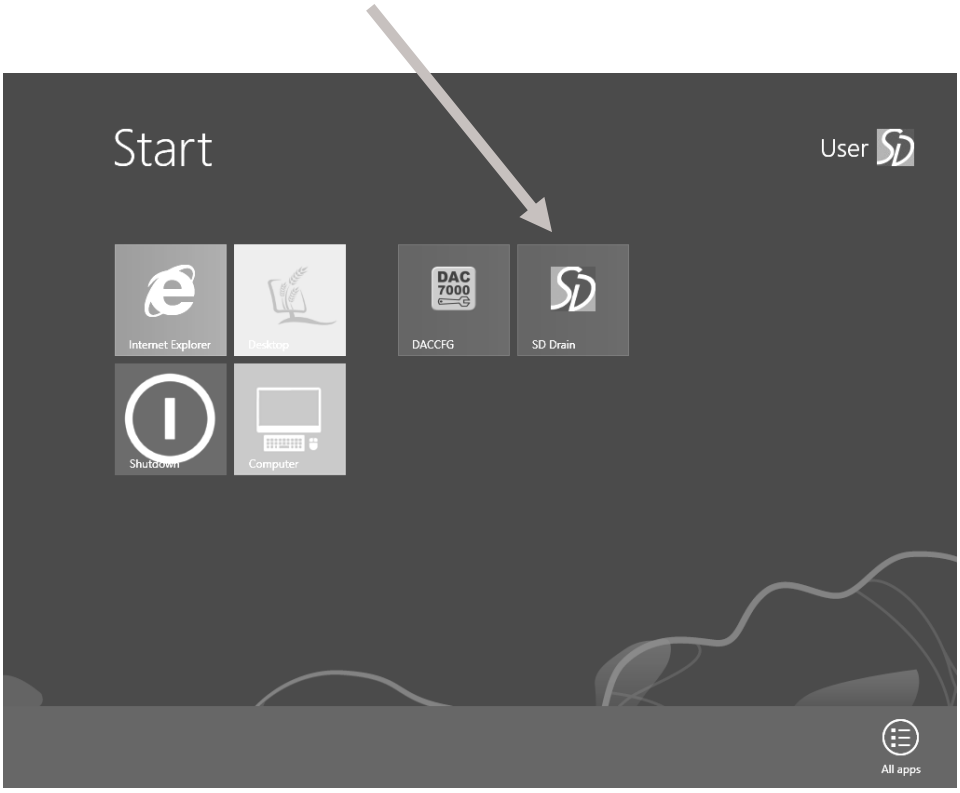
2



Locate the control computers power rocker switch behind the lower right back of the computer.

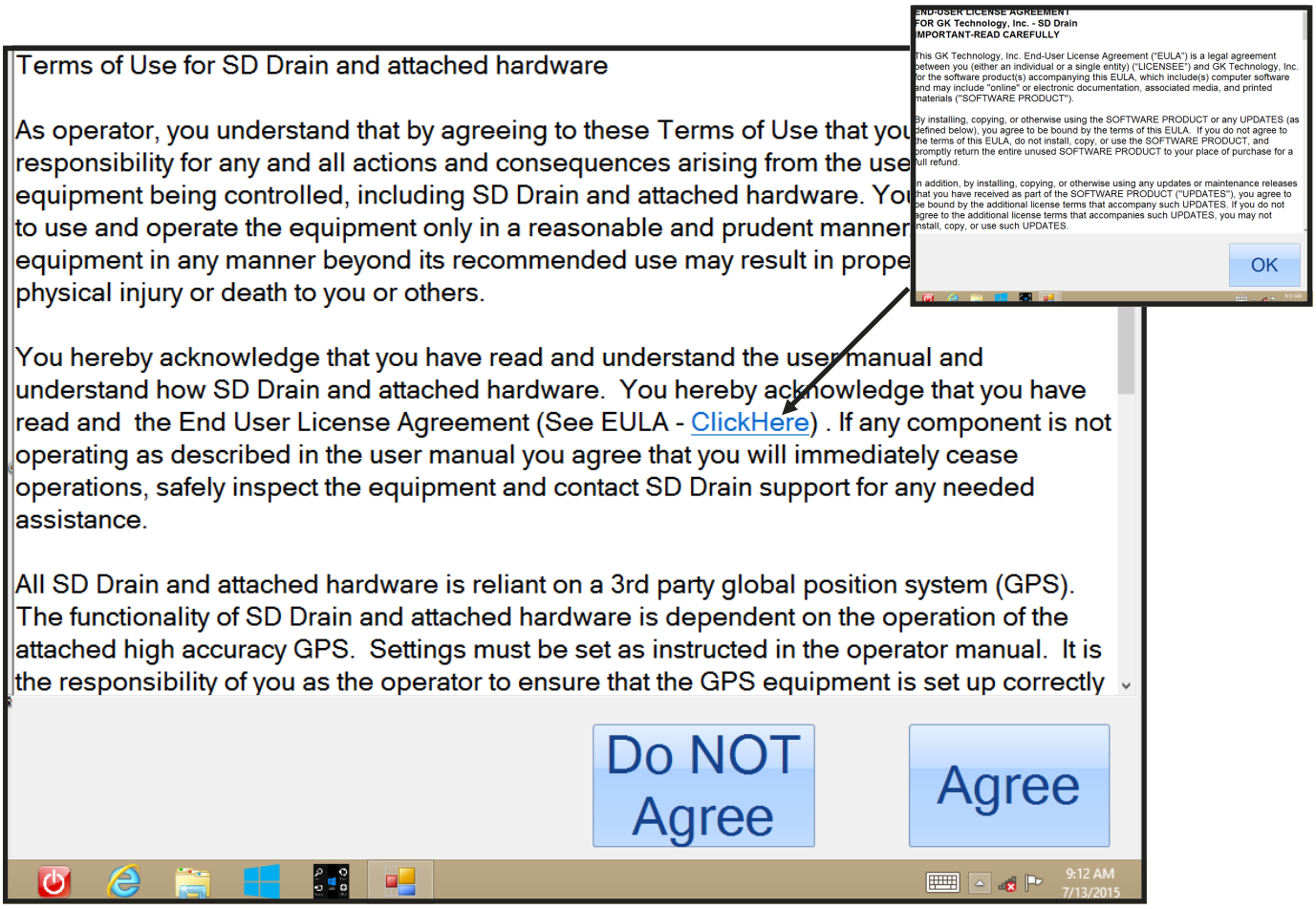
Press and hold the rocker power switch for 10 seconds to turn the computer on. When the computer boots to the Start Screen double tap on the SD Drain icon.

Double Tap the SD Drain icon to start the program.



EULA and Disclaimer

3 After the SD Icon was double tapped the first screen that appears is the Terms of Use Screen. First tap to read the EULA and then Scroll down to read the disclaimer and then tap to Agree or Do NOT Agree.


Terms of Use for SD Drain and attached hardware
As operator, you understand that by agreeing to these Terms of Use that you
responsibility for any and all actions and consequences arising from the use
equipment being controlled, including SD Drain and attached hardware. You
to use and operate the equipment only in a reasonable and prudent manner
equipment in any manner beyond its recommended use may result in prope
physical injury or death to you or others.
You hereby acknowledge that you have read and understand the user manual and understand how SD Drain and attached hardware. You hereby acknowledge that you have read and the End User License Agreement (See EULA - ClickHere) . If any component is not operating as described in the user manual you agree that you will immediately cease operations, safely inspect the equipment and contact SD Drain support for any needed assistance.
All SD Drain and attached hardware is reliant on a 3rd party global position system (GPS). The functionality of SD Drain and attached hardware is dependent on the operation of the attached high accuracy GPS. Settings must be set as instructed in the operator manual. It is the responsibility of you as the operator to ensure that the GPS equipment is set up correctly
Do NOT Agree
Agree
9:12 AM
7/13/2015
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FOR GK Technology, Inc. - SD Drain
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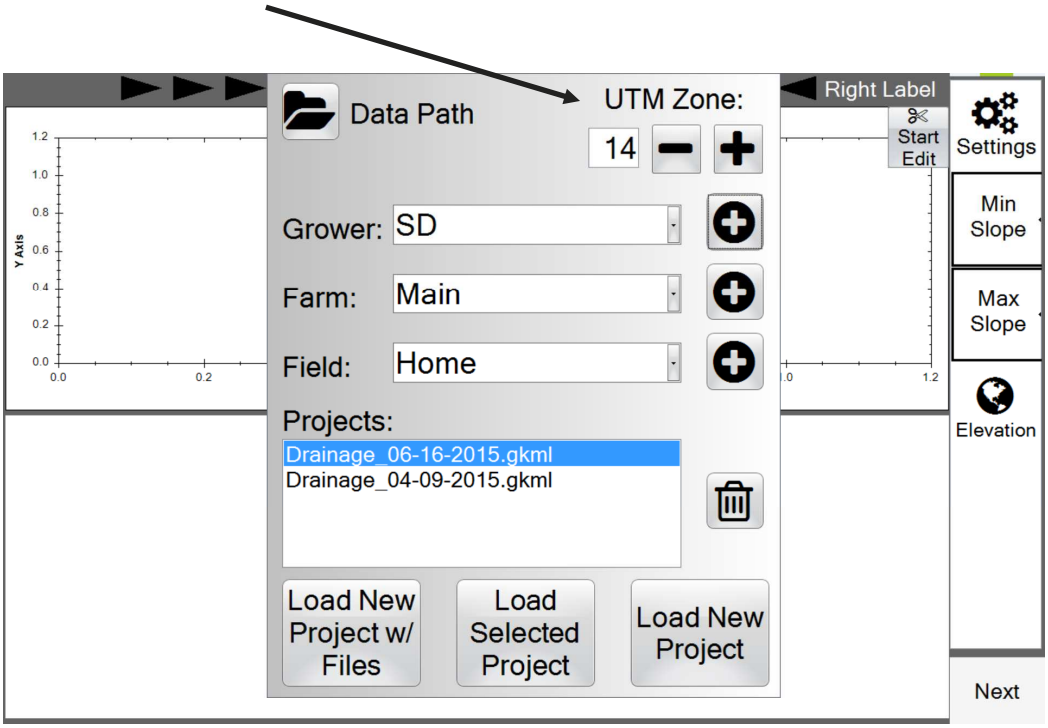
OK

Note, Every time the program is started the user must tap **Agree** or **Do NOT Agree** on the Terms of User screen

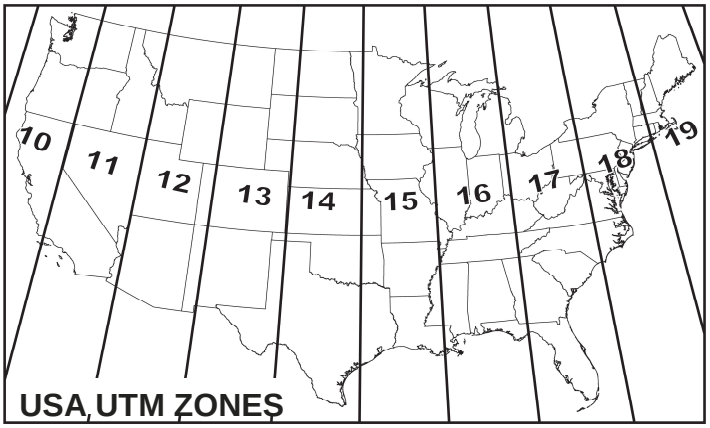
4 UTM Zone Setup

The first screen that appears after tapping the **Agree** box from the Disclaimer page is the is shown below. Set the UTM Zone where SD Drain will be operating in. If you are not sure what zone to enter, do a internet search asking "what UTM zone am I in?"

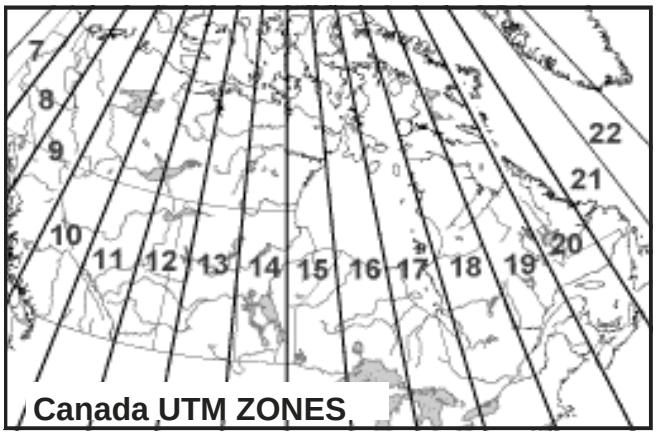
Press **"-" or "+"** to set the zone. Once set, it will automatically be saved



UTM—Acronym for "Universal Transverse Mercator". A projected coordinate system divides the world into 60 north and south zones, 6 degrees wide.This is what everything is projected in within the software. Being in the correct UTM zone is critical to ensure the location is accurate.



USA UTM ZONES



Canada UTM ZONES

Input User Information

5 Follow instructions below to enter the appropriate information. You must load a project to advance to the next screen.

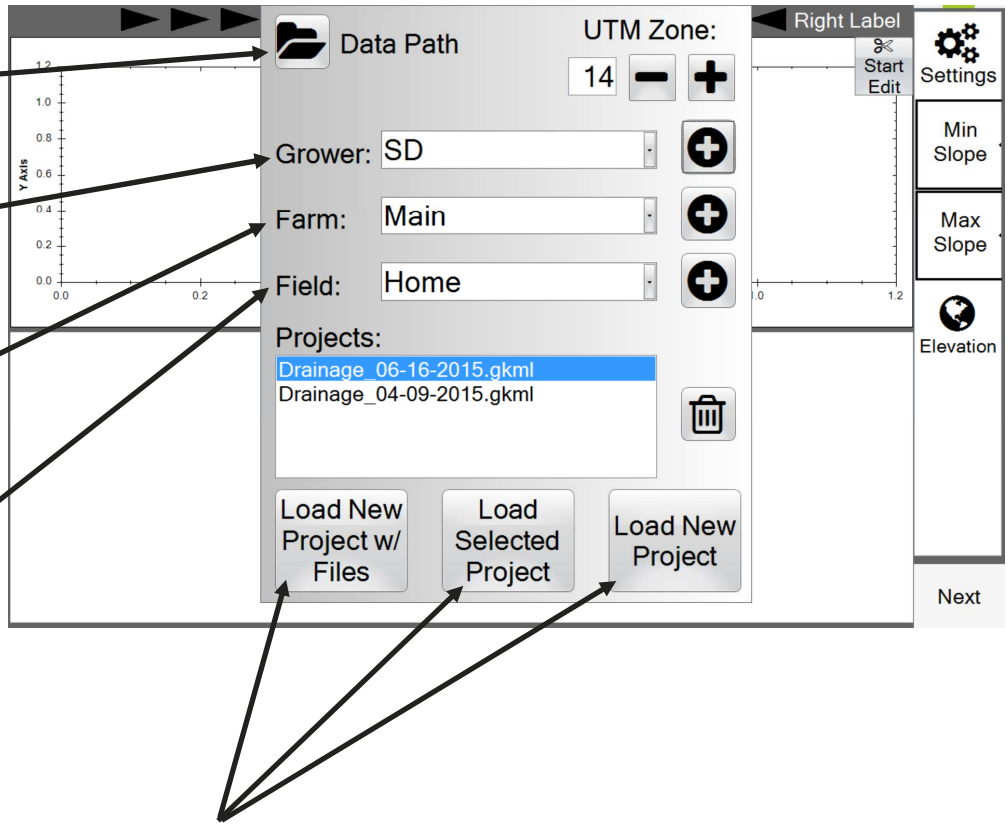
Data Path; only change if you wish to save a project to a file other than the default file.

Grower; Add grower using the "+" button or choose Grower using dropdown menu.

Farm; Add Farm using the "+" button or choose Farm using dropdown menu.

Field; Add Field using the "+" button or choose Field using dropdown menu.

Note: it is critical to label each field you are in for future reference.



Select one of these three options:

Load New Project w/ Files; Use this section if you have a background image or predesigned map to load with the new project. A layers screen will pop up showing the selections. Change or add the correct files to bring them to the working screen. Select Continue to bring up the working screen of SD Drain.

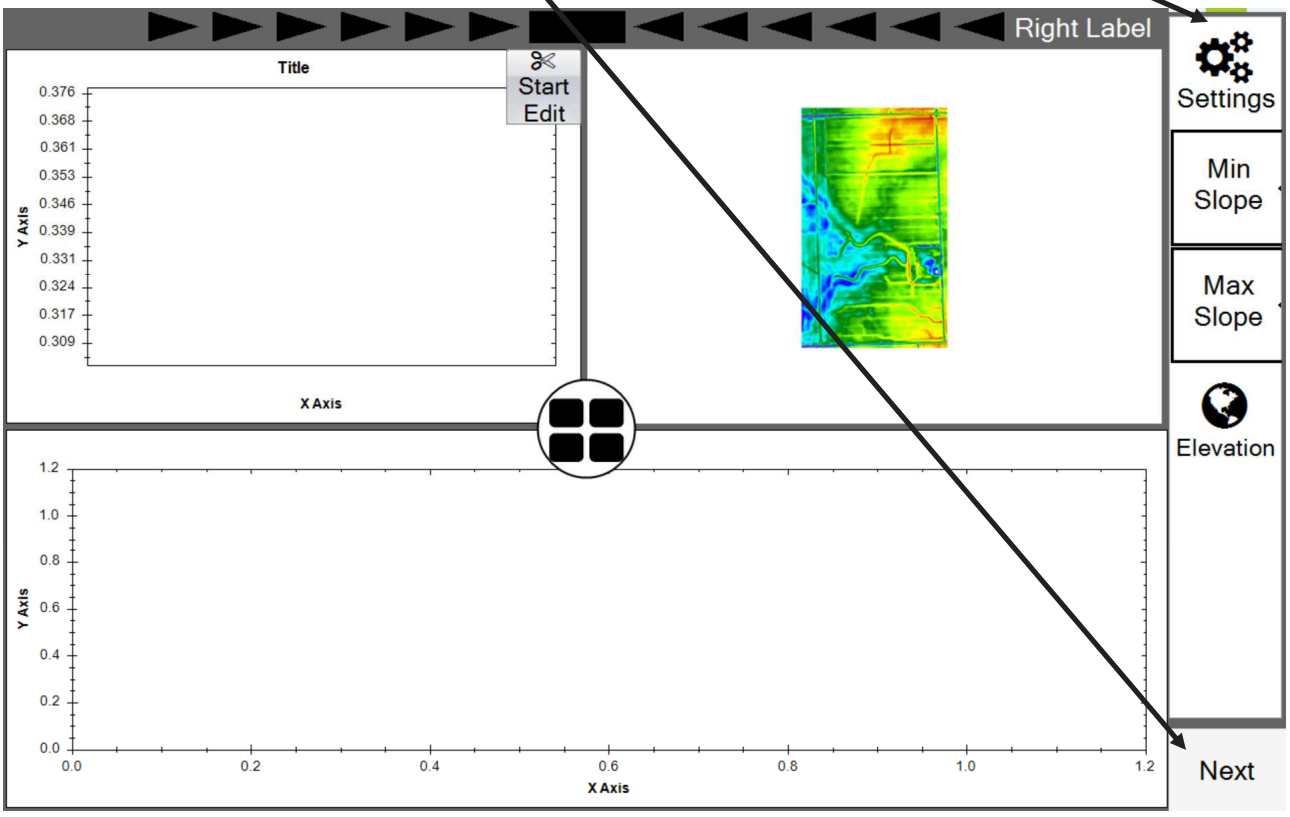
Load Selected Project; if you have already worked on this field.

Load New Project; if this is the start of a new field without extra files.

Projects; displays all created projects for the field.
To load a previous project, highlight the desired project and press the Load Previous Project button. To delete an old, unwanted project, highlight it in the project list and click the trash can. You will be prompted to confirm you want to send the project to the trash can. Select Yes to confirm and No to cancel.

Machine Control Settings

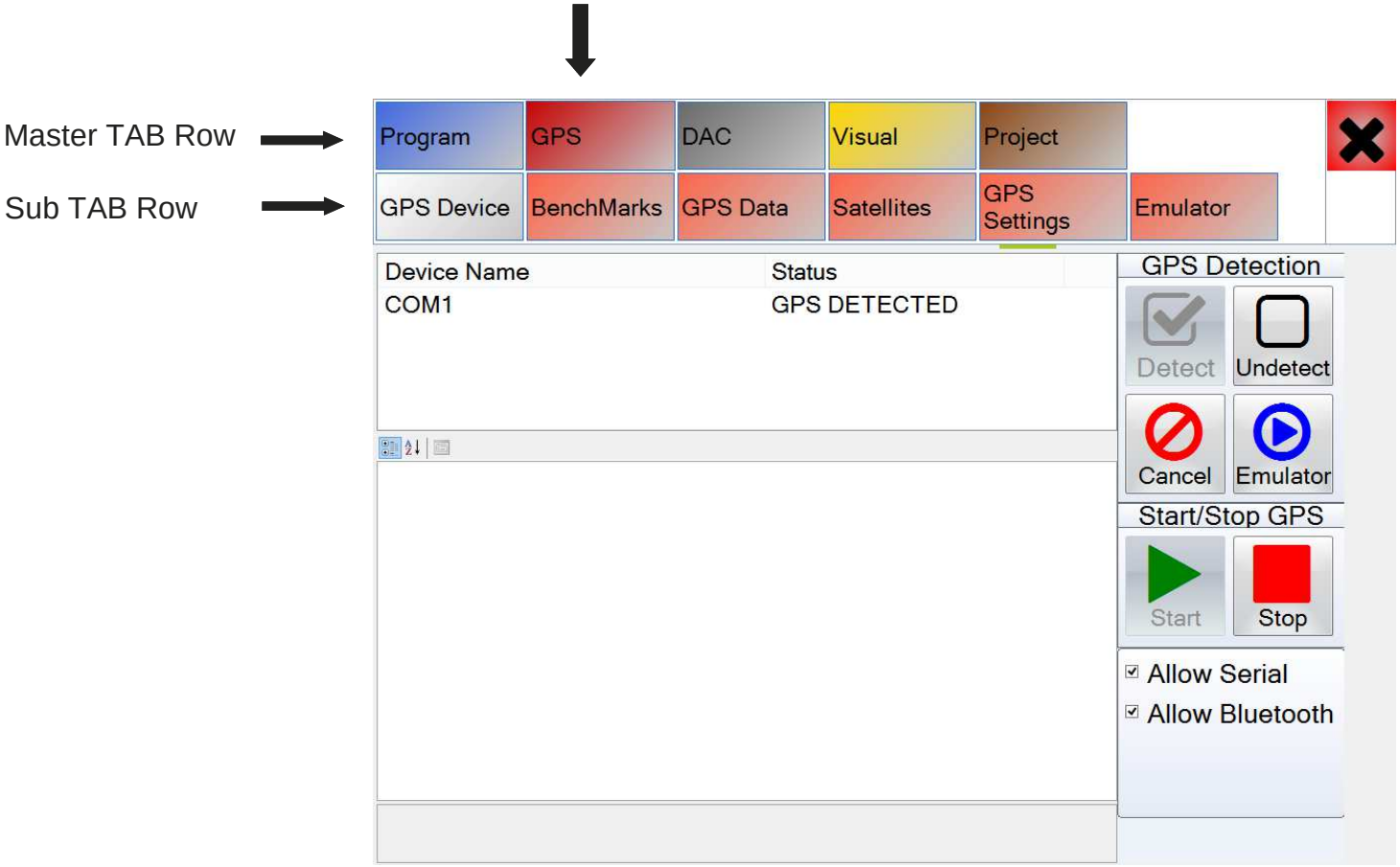
6 The next few steps will have default settings for most sections. It is recommended to only change the default settings after using the program for a period of time. Tap on the “Settings” icon to open. If the “Settings” icon is not visible, tap on the **“Next”** icon until the “**Settings”** icon is visible.



Settings Page

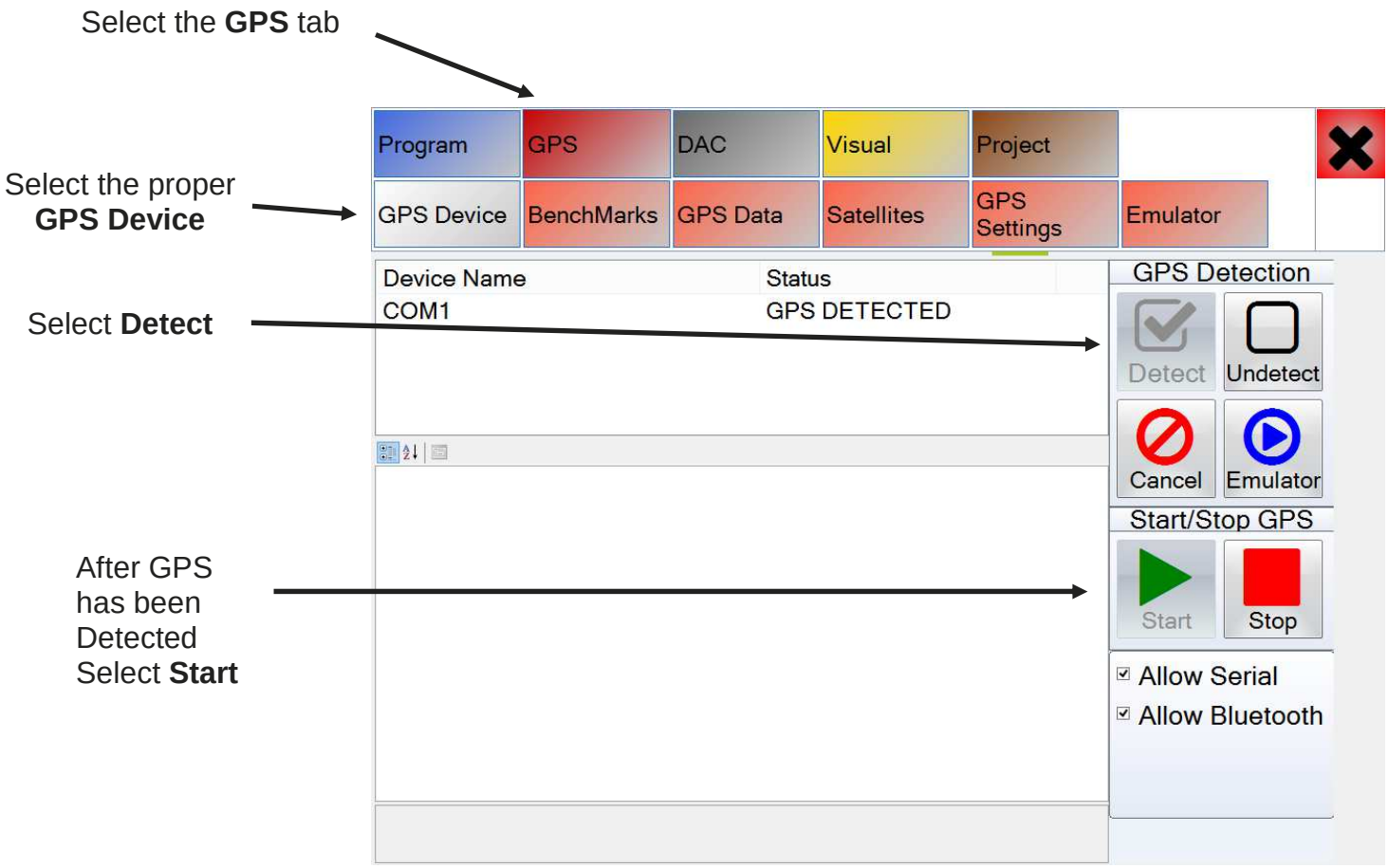
7 After tapping the "**Settings"** icon tab you will see the settings screen. The top row is the master TABS row. The second row is the sub TAB row. The sub TAB row changes content and color depending on which selection is highlighted in the master TAB row.

Select the **GPS** master tab first and proceed to the next page of this manual.



GPS Receiver Settings

8 After selecting the red GPS master tab you will see six GPS red sub tabs. SD Drain detects the GPS receiver and sets the GPS parameters automatically as required by SD Drain. Follow the instructions below to detect and start the GPS receiver. Be sure all cables are connected from the GPS receiver to control computer first.

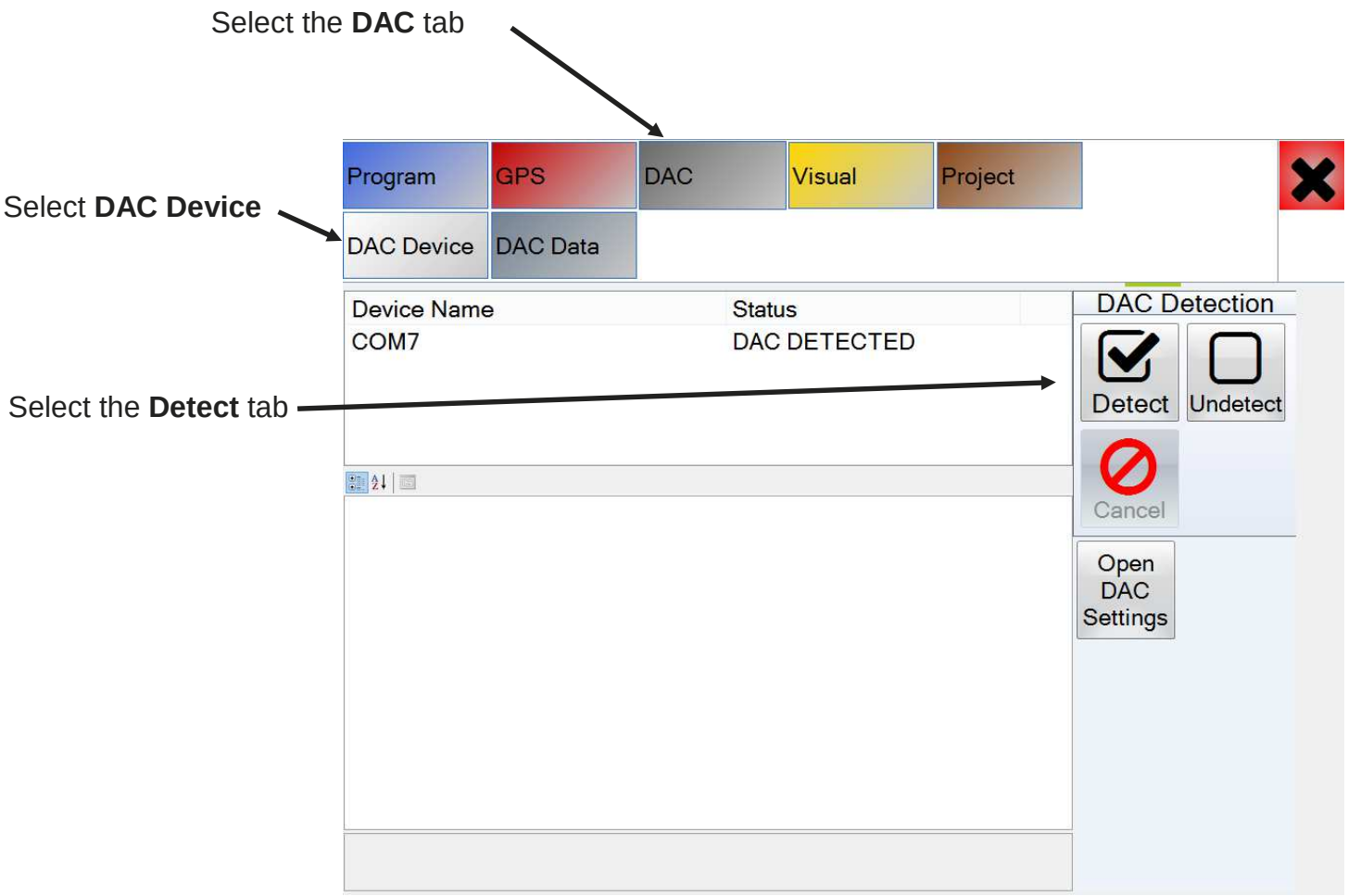


After you see that GPS is detected in the status section and “Start” has been tapped, Proceed to the next page to set up the DAC auto controller.

DAC Settings

9

The DAC module controls the tractors hydraulic *SCVs* (Selectable control *valves*). or can be connected to external hydraulic valves. See the 2015 DAC installation manual for proper tractor connection instructions.



When **DAC DETECTED** appears in the status screen proceed to the next page to enter Machine settings.

Machine (Scraper) Settings

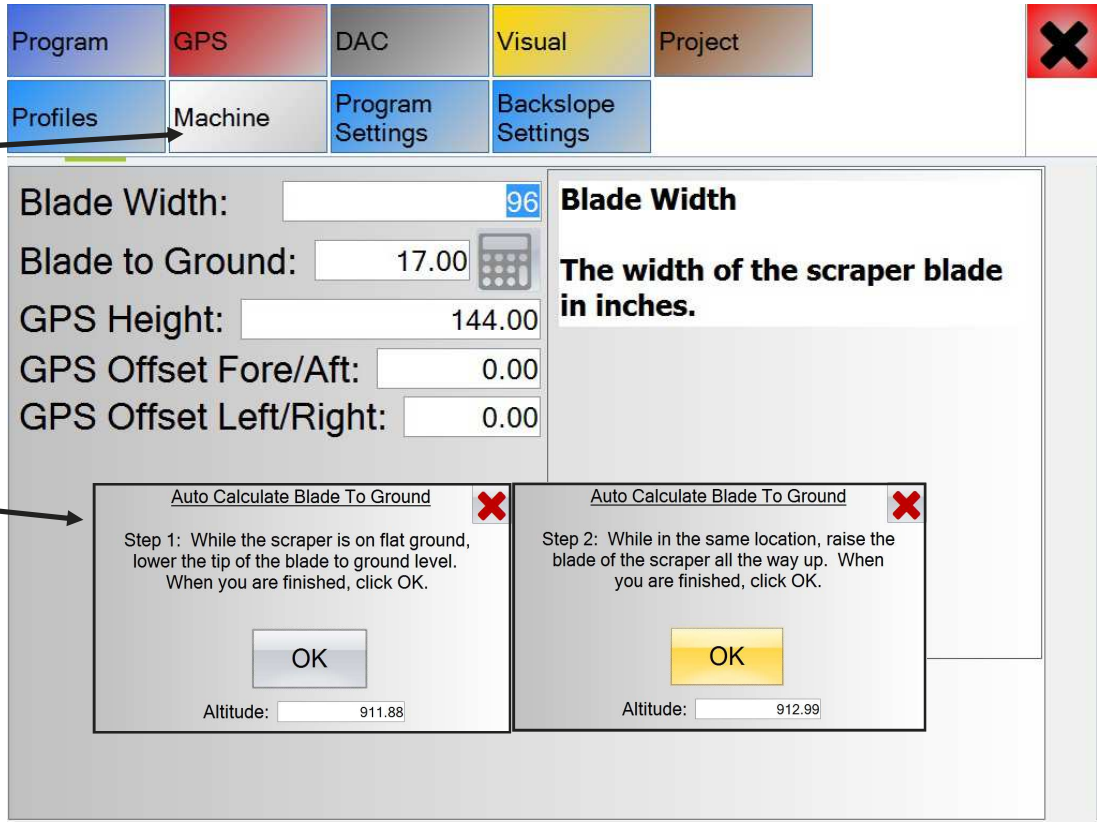
10 Input the required settings for the Machine (Scraper) you are working with. Note the instruction box to the right. Accuracy of these inputs is important.

Select **Program** Tab

Select **Machine Tab**

Insert accurate values into each fields or select the **calculator** to auto calculate the blade to ground and follow the instructions in the pop up boxes

If assistance is needed, see page **24** for more info.



Definitions:

Blade Width: The width of the scraper blade in inches.

Blade to Ground: The Distance from the scraper blade to flat ground in inches (have the blade positioned all the way up). Touch the Calculator to read automatically. GPS is needed.

GPS Globe Height: The height from the GPS Globe to the ground in inches (position blade on the ground).

GPS Offset Fore(+)/Aft(-): The distance, in inches, from the GPS globe to the center of the blade.

GPS Offset Left(+)/Right(-): The distance, in inches, from the GPS globe to the center of the blade.

After all values are filled in this will finish the initial setup. You may now start a ditch.

Quick Reference Guide—Ditching

Start at the top of the ditch with the blade all the way up.

Select **Start Survey**

Drive the ditch, follow exactly where you want the ditch to be.

Select **Stop Survey** at the end of the ditch.

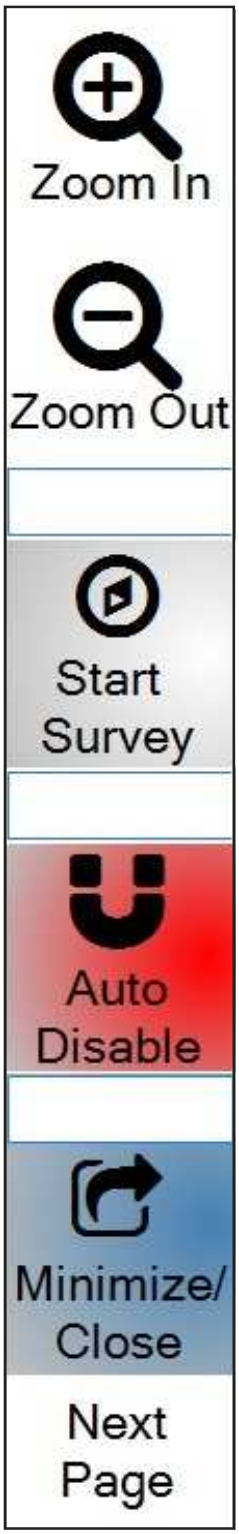
Confirm **Auto Enable** is on.

Cut the ditch.

When finished, start a new ditch by selecting **Start Survey**.

You will be asked if you want to save the ditch. Select YES if you want it saved or No if you would like it discarded.

Quick Access Buttons Page 1 Overview



Zoom In:
Tap this button and then touch on the screen where you would like to zoom in on (This will re-center the image to wherever you click and zoom in on that area).

Zoom Out:
Tap this button and then touch on the screen where you would like to zoom out on. This will re-center the image to wherever you click and zoom out on that area.

Start Survey:
This button allows the user to Start and Stop Surveys. How to survey will be explained on page 10

Auto Enable/Disable:
This button will allow the user to use Automatic control of the implement's hydraulics. During a survey, this will also pause and resume the survey. See page 11 for more information.

Minimize/Close:
This button allows closing and minimizing the program. See pages 12-13 for more information.

Next Page:
Touch this to acquire access to the next page of quick access controls.

Starting a Survey

Start Survey:
Touch the **Start Survey** button when you are at the start of the ditch with the blade up. Drive toward the opposite end of the ditch, following the contour of the ditch and staying in the bottom.

Stop Survey:
When you get done with the survey, touch the **Stop Survey** button. This will finish the survey and design the ditch. To start a new ditch in this project, just touch the Start Survey button, repeating the above steps.

Pause Survey:
The **Pause Survey** button can be used to pause the survey if you need to go around a pole, culvert, water, etc.

Resume Survey:
To resume the current survey, select **Resume Survey,** which will restart the survey from the current point. Remember to leave the blade all the way up during the entire survey.

Auto Buttons

The Auto button will allow you to run automatic control of the hydraulics.
Touch button to turn off and touch to turn automatics on.

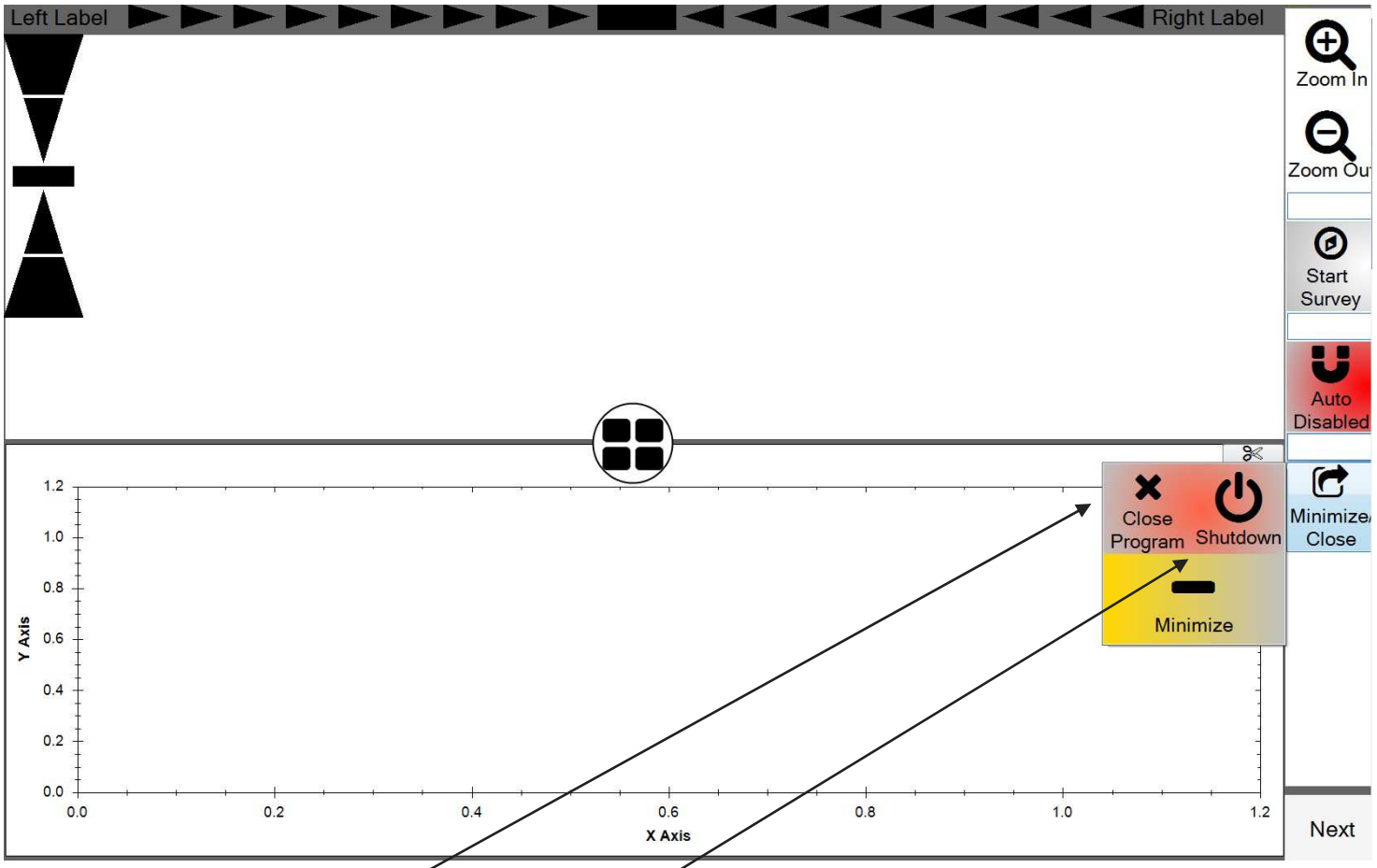
The Auto Disable will be red if off

Green is Auto Enable is on

Out of Range means Auto Enable is on but the user is out of the designed area and not recording work done and SD will not be controlling the blade.

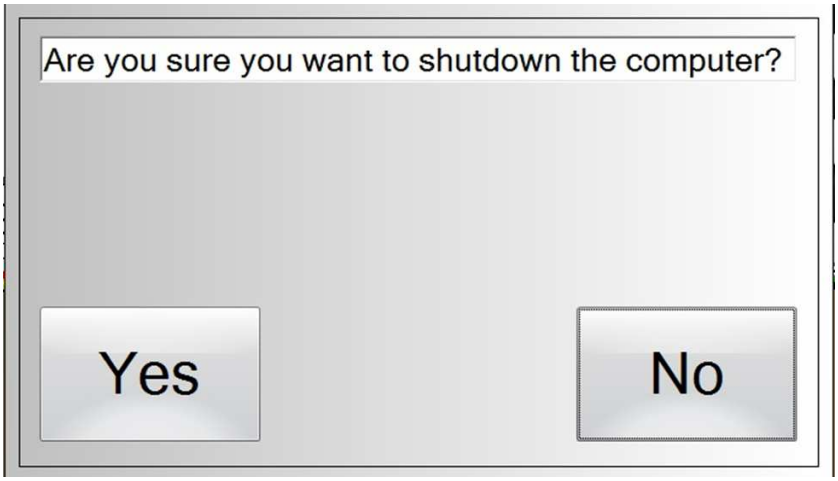
Minimize / Close Button

Close and Shutdown Buttons



Touch **Close Program** to close out of SD Drain. This will save all the work that has been done.

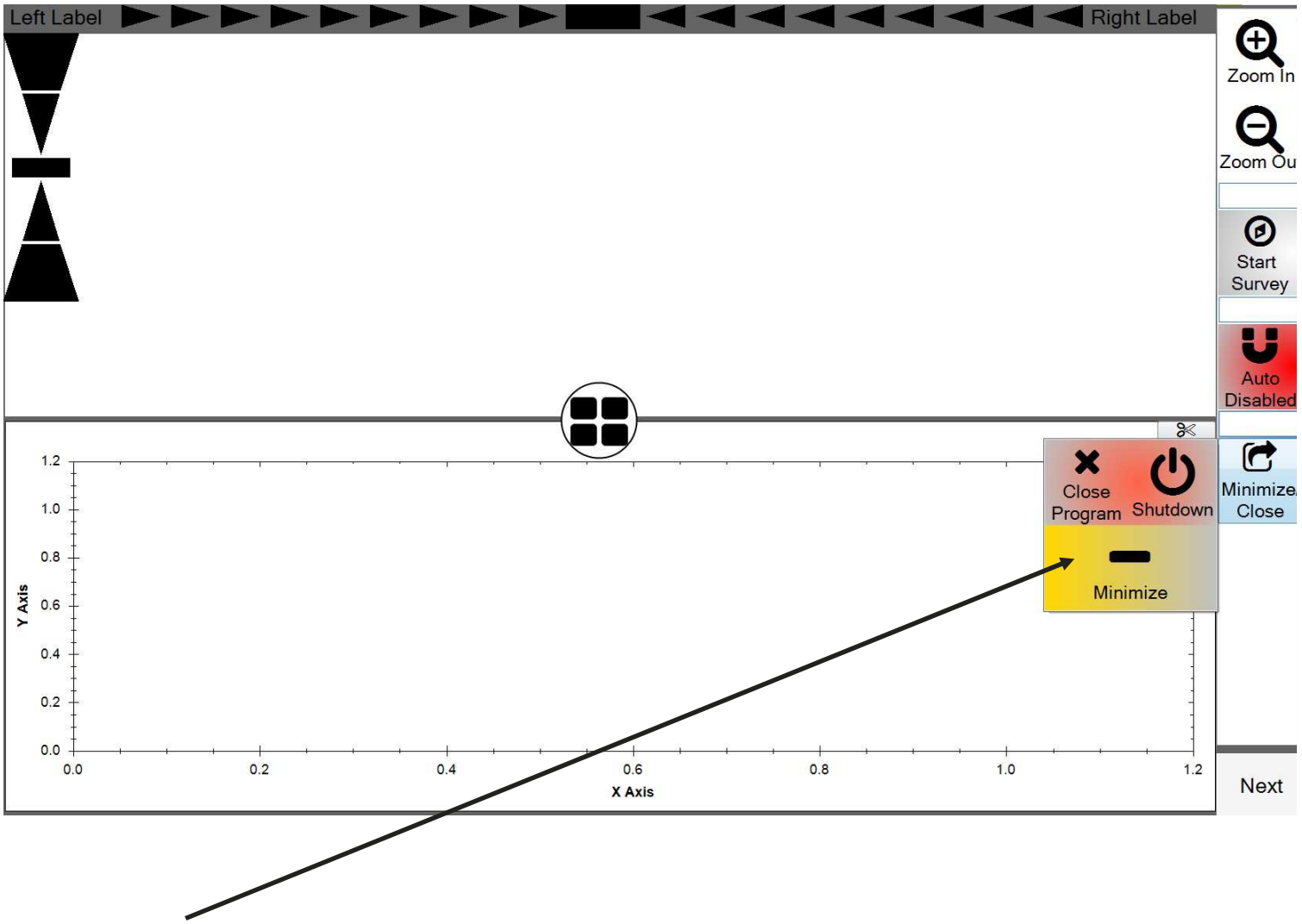
Touch **Shutdown** to close the program and shut down the computer.



You will have to select Yes or No to confirm.

Minimize / Close Button

Minimize Button

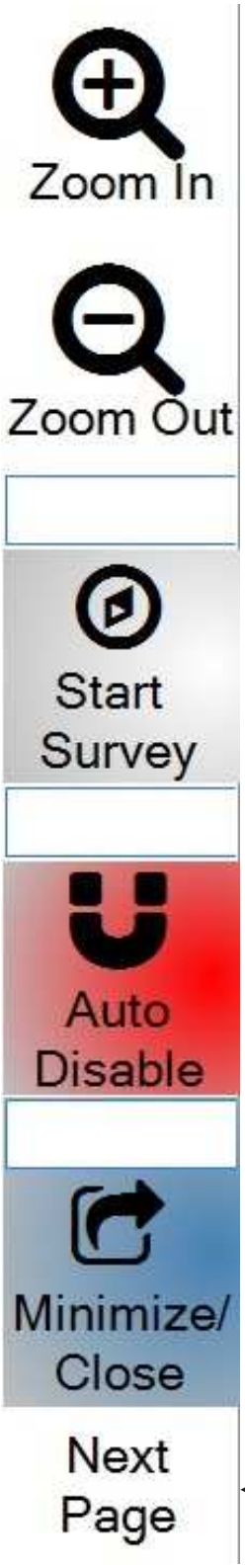


Touch **Minimize** button to minimize SD Drain and get back to the main screen of the computer.

To bring back up SD Drain, touch the SD Drain logo on the bottom of the screen.

Go to Next Page

Next Page Button



Touch the **Next Page** button on the bottom right to get another set of buttons.

Quick Access Buttons Page 2 Overview

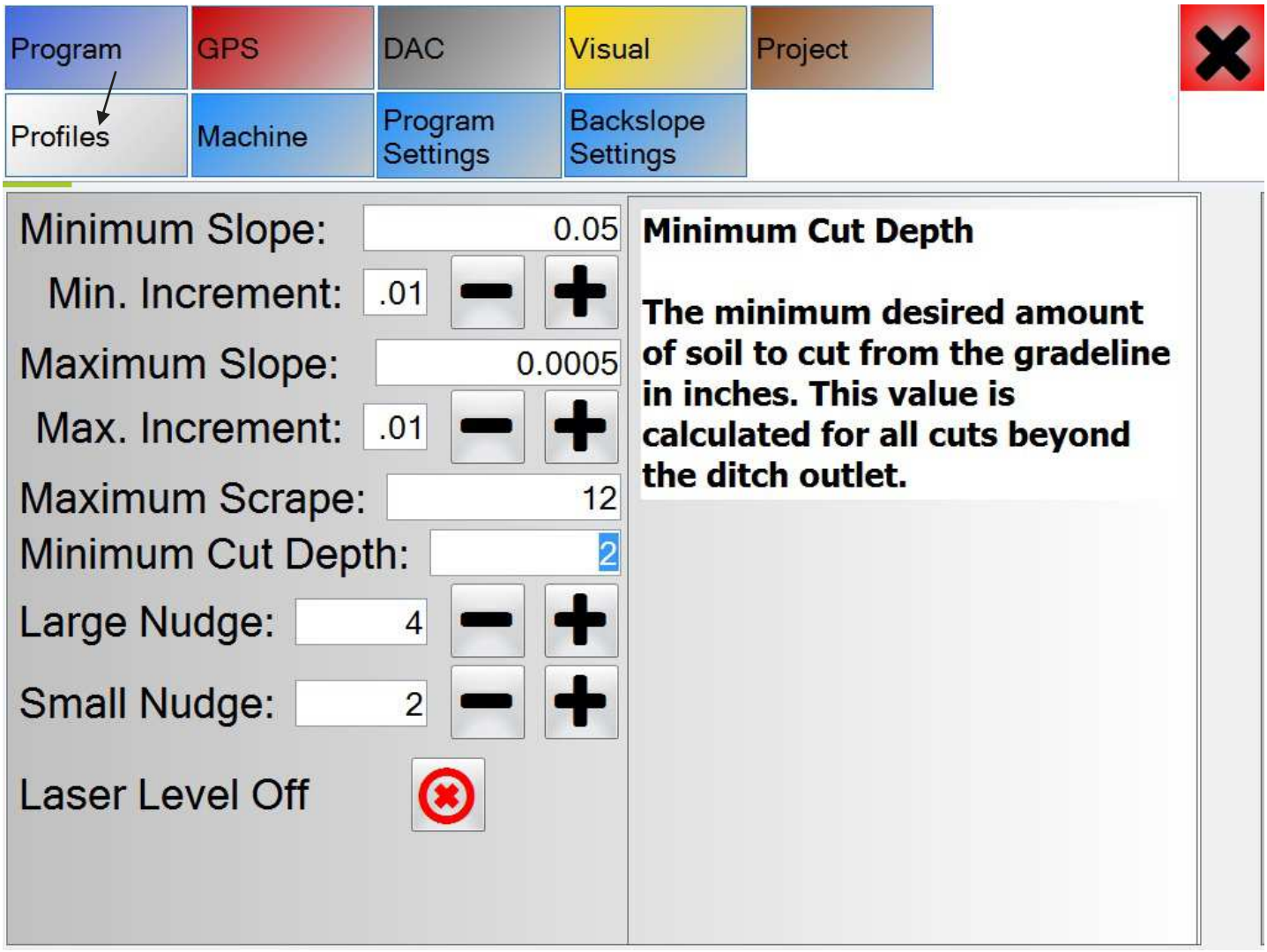
Quick Access Buttons—Page 2

Settings Button

Press **Settings** button on top to get into the expanded drop down Settings Menu

Settings—Program Menu

Program Menu—Profiles

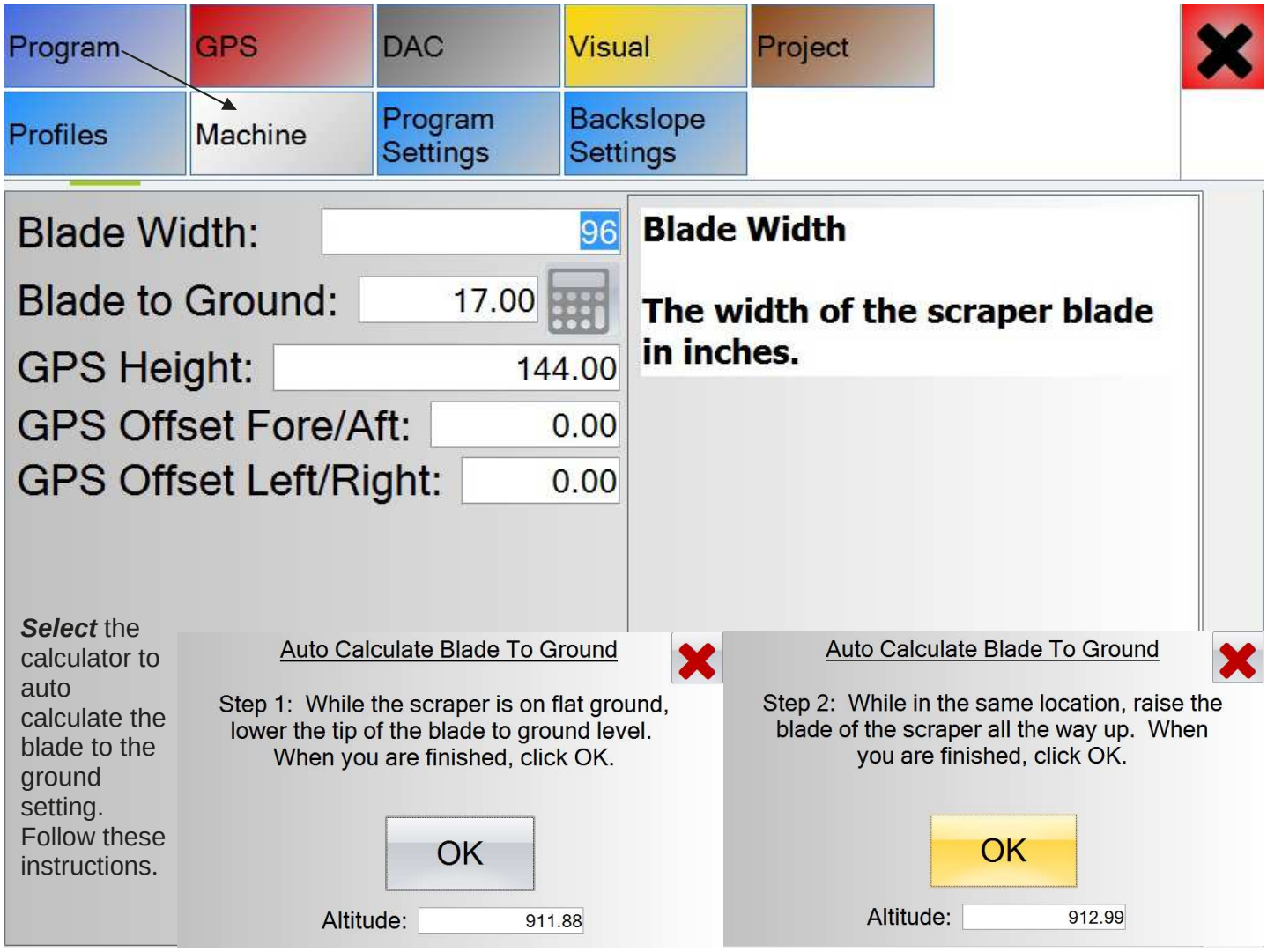


Definitions:

Minimum Slope: The desired minimum slope of each cut in percent.
Minimum Increment: The amount to adjust either up/down the minimum slope on the +- buttons on the main slider.
Maximum Slope: The desired maximum slope of each cut in percent
Maximum Scrape: The max depth of the scraper cut in inches
Minimum Cut Depth: The minimum desired amount of soil to cut from the grade line in inches. This value is calculated for all cuts beyond the ditch outlet.
Large Nudge: The amount to nudge the “large nudge factor” in tenths
Small Nudge: The amount to nudge the “small nudge factor” in tenths
Laser Level Off: Turn this On to do a straight grade like a laser would

Settings—Program Menu

Program Menu—Machine


Program
GPS
DAC
Visual
Project
Profiles
Machine
Program Settings
Backslope Settings
Blade Width: 96
Blade to Ground: 17.00
GPS Height: 144.00
GPS Offset Fore/Aft: 0.00
GPS Offset Left/Right: 0.00
Blade Width
The width of the scraper blade in inches.
Select the calculator to auto calculate the blade to the ground setting. Follow these instructions.
Auto Calculate Blade To Ground
Step 1: While the scraper is on flat ground, lower the tip of the blade to ground level. When you are finished, click OK.
OK
Altitude: 911.88
Auto Calculate Blade To Ground
Step 2: While in the same location, raise the blade of the scraper all the way up. When you are finished, click OK.
OK
Altitude: 912.99

Definitions:

Blade Width: The width of the scraper blade in inches.

Blade to Ground: The Distance from the scraper blade to level ground in inches (have the blade positioned all the way up). Touch the Calculator to read automatically. GPS is needed.

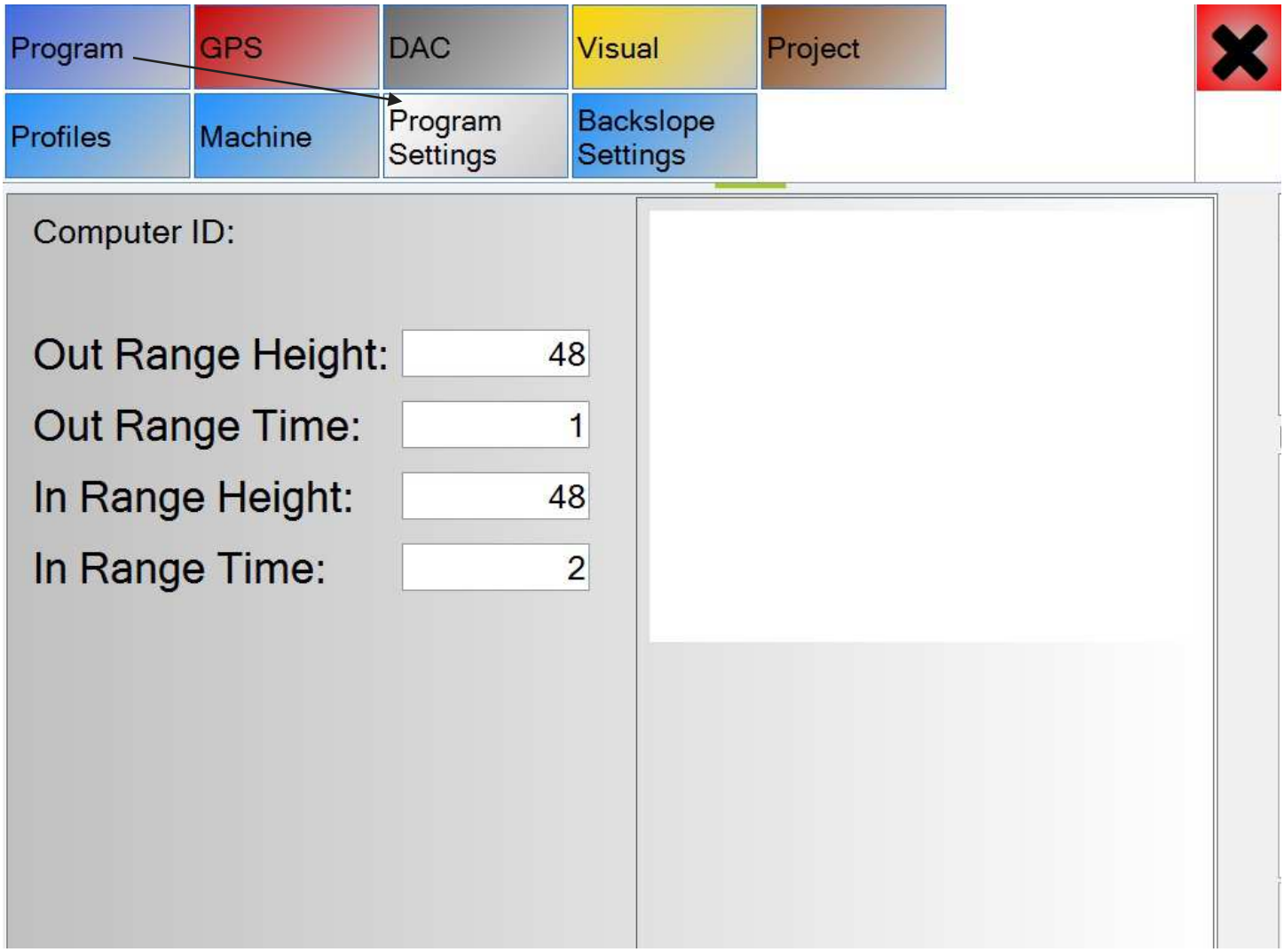
GPS Globe Height: The height from the GPS Globe to the ground in inches (position blade on the ground).

GPS Offset Fore(+)/Aft(-):
The distance, in inches, from the GPS globe to the center of the blade.

GPS Offset Left(+)/Right(-):
The distance, in inches, from the GPS globe to the center of the blade.

Settings—Program Menu

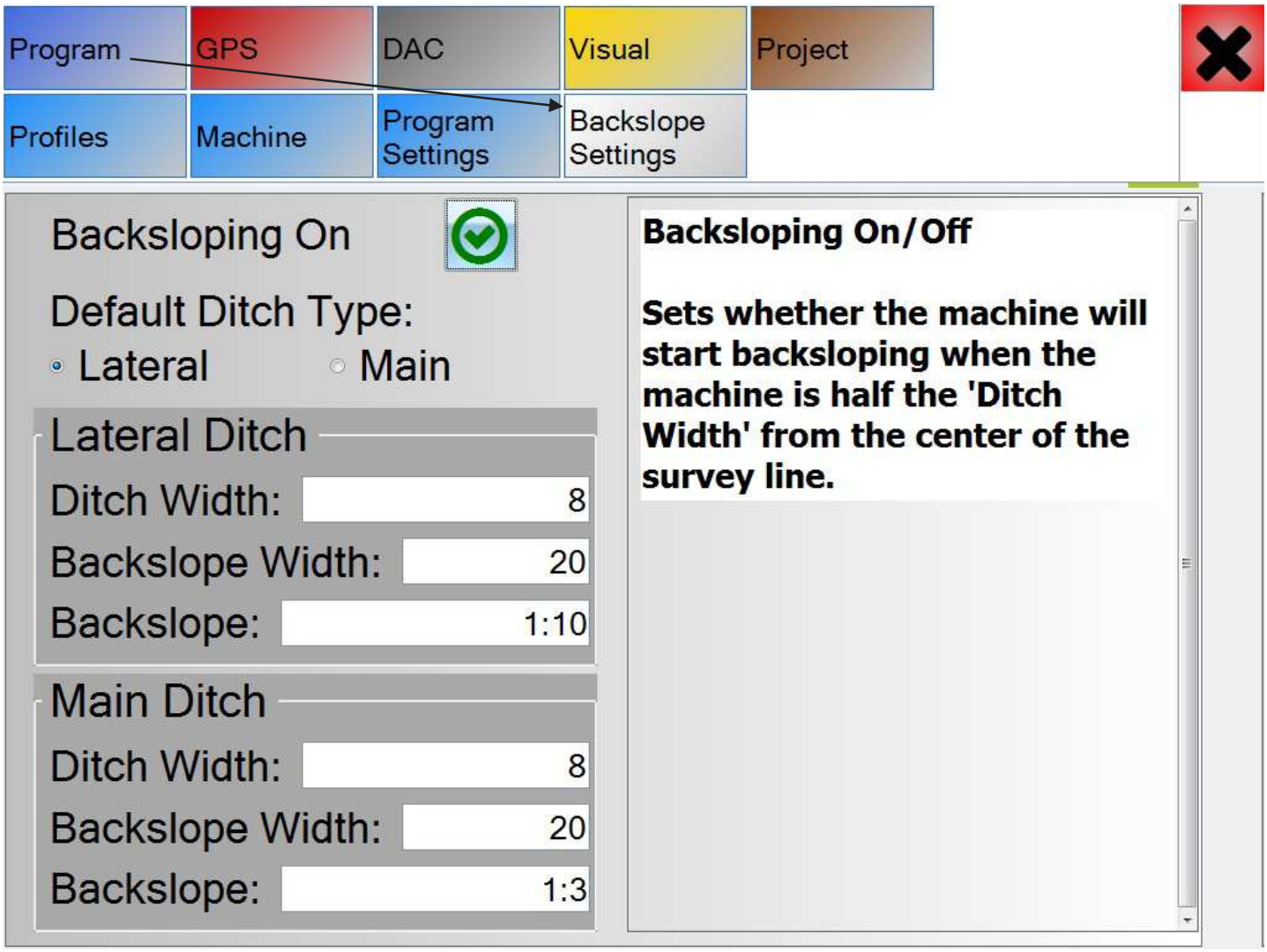
Program Menu—Program Settings



* Leave the defaults alone unless directed by a technician.

Settings—Program Menu

Program Menu—Backslope Settings



Backsloping On: Touch icon, green check is on, red x is off.
Definitions:
Lateral Ditch: A lateral Ditch is usually the smaller ditch that flows into a main ditch.

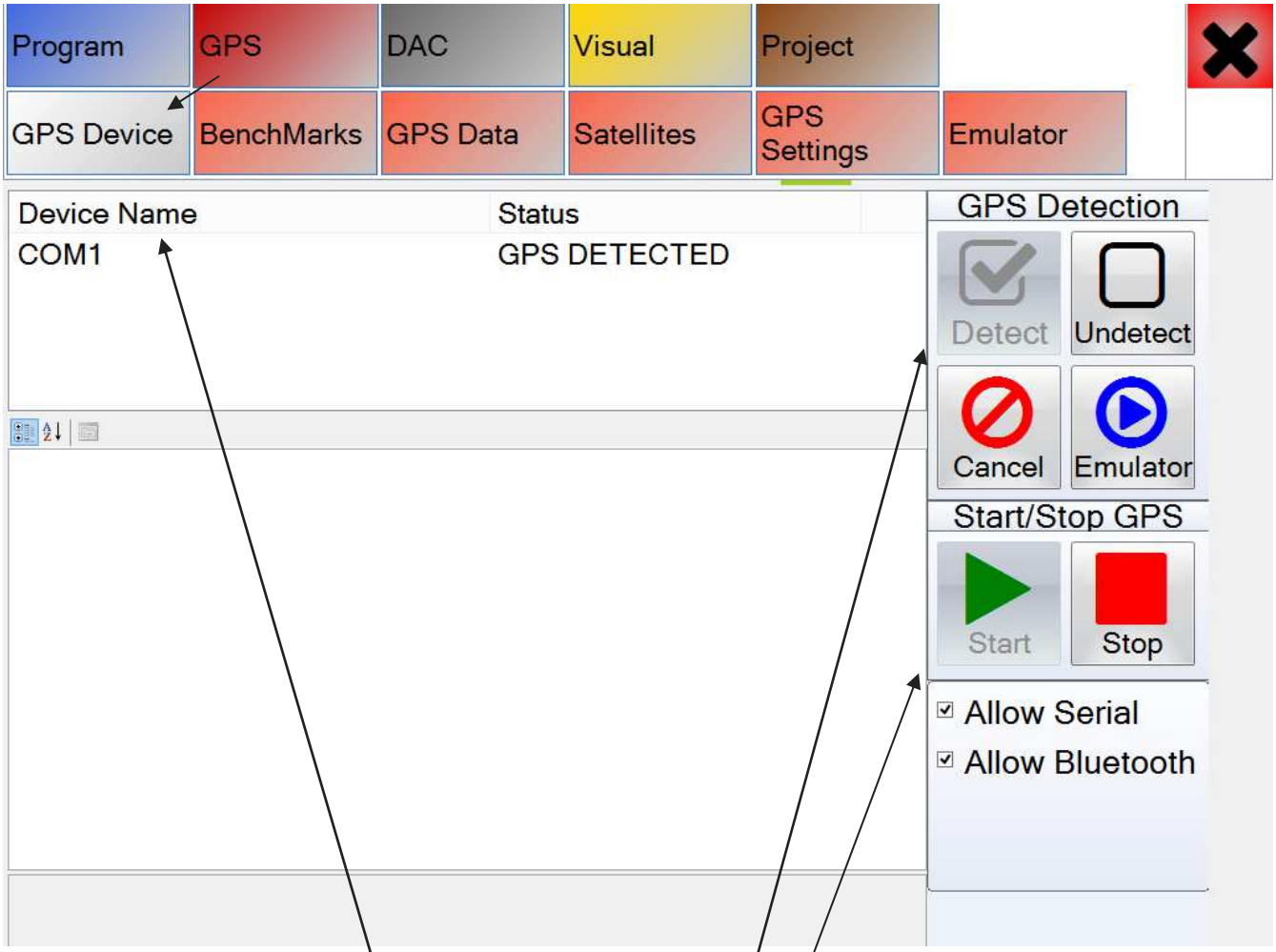
- **Ditch Width:** The width of the bottom of the ditch
- **Backslope Width:** The distance from the bottom of the ditch to the distance in which you want to backslope.
- **Backslope:** The ratio of the backslope cut (e.g, 1:3 where 1 is the rise and 3 is the run)

Main Ditch: This is the typically larger ditch that will receive water from the smaller, lateral ditches.

- **Ditch Width:** The width of the bottom of the ditch
- **Back Slope Width:** The distance from the bottom of the ditch to the distance in which you want to backslope
- **Backslope:** The ratio of the backslope cut(e.g, 1:3 where 1 is the rise and 3 is the run)

Settings—GPS Menu

GPS Menu—GPS Device



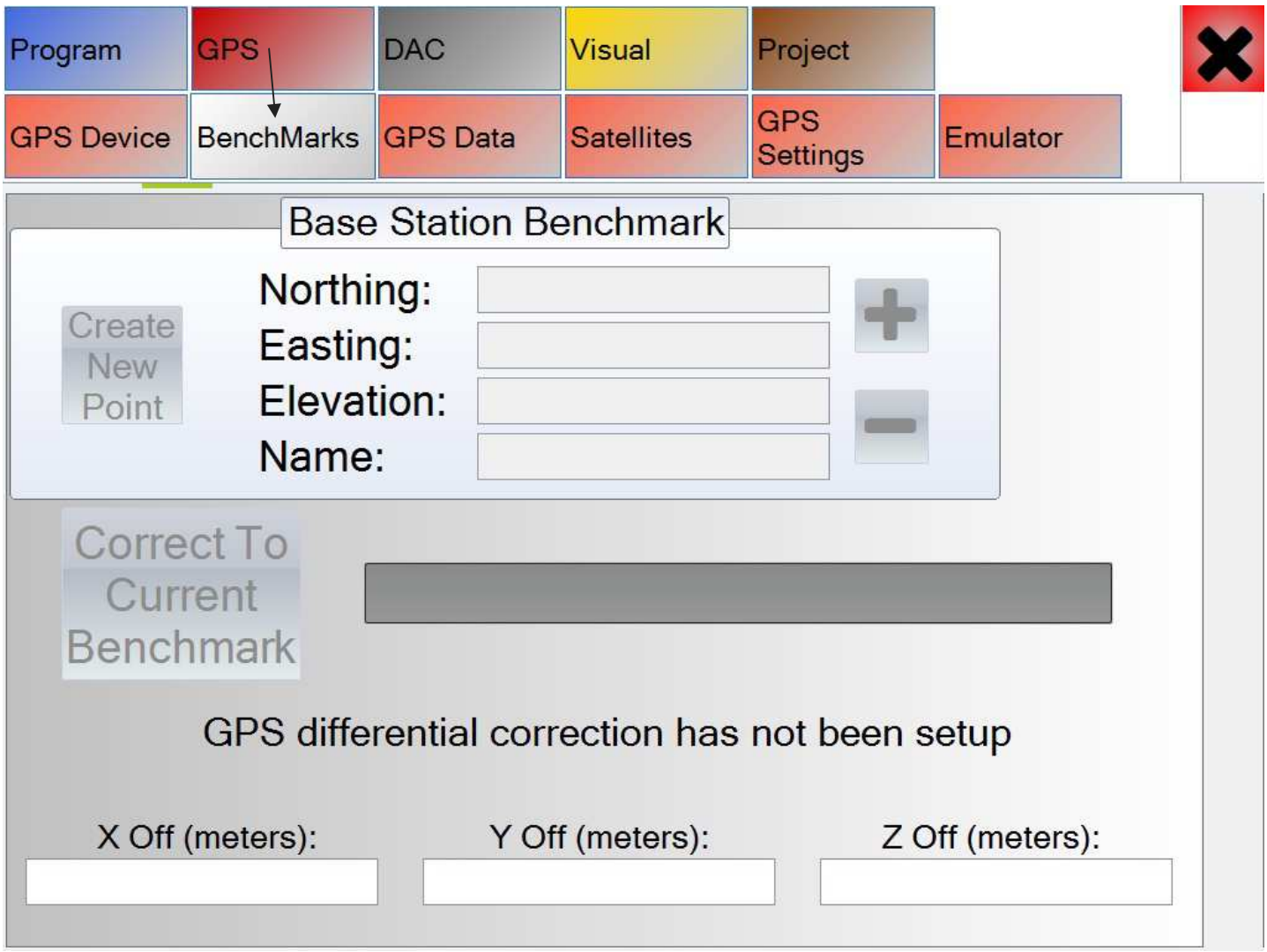
To set up **GPS**, select **Device Name** and select the **Detect** button. This should automatically select the COM port that the GPS is coming into. Then select **Start** button to start using the GPS.

GPS Settings that need to be set before connecting to SD Drain:

- Baud Rate
  Set at 57600 or 38400 (57600 is preferred)
- NEMA Strings 3 Required
  GGA — 10Hz or 5Hz (only use 5Hz if 10Hz is unavailable)
  GSA — 1Hz
  RCM or VTG (RCM is preferred) - 1Hz

Settings—GPS Menu

GPS Menu — BenchMarks



BenchMarks are for repeatability of RTK GPS. It is a real world known location that can be accessed at any time based on the coordinates. BenchMarks are very important for any brand RTK for repeatability from day to week to year.

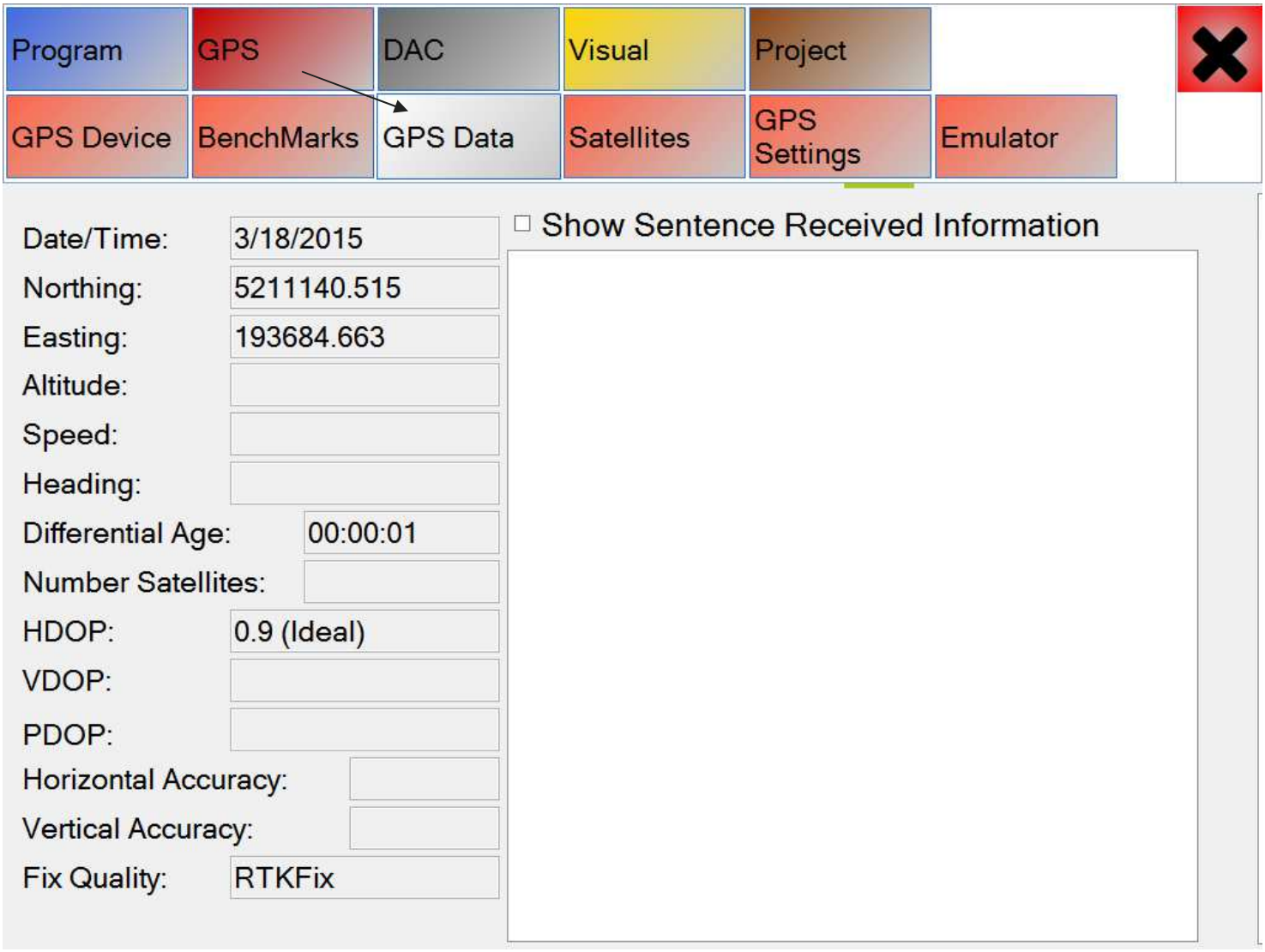
BenchMarks should be placed at locations easily about to accessing in the future (e.g. above a culvert, corner post).

You need to have the GPS Globe Height and Blade to ground set correctly.

The best time to capture a BenchMark is to take it at night and load it up before moving the implement in the morning (the blade must be all the way up at all times to avoid settling).

Settings—GPS Menu

GPS Menu—GPS Data



If you select **GPS Data**, this will show you the quality that you have at the current time.
If GPS is ever lost due to bad satellites, trees, broken cables/antennas, a red flashing screen will come up on the home page indicating you have bad signal.

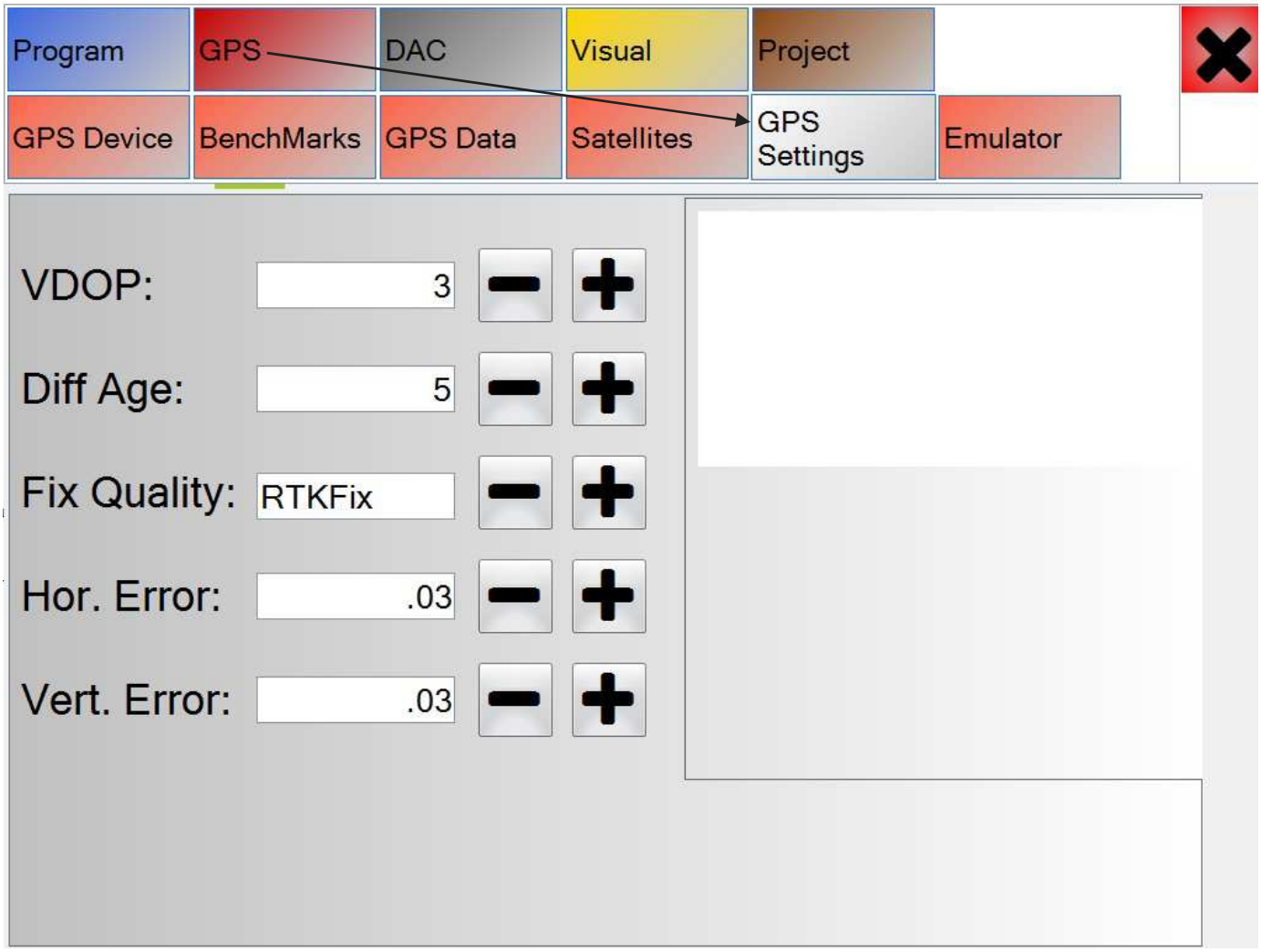
Settings—GPS Menu

GPS Menu—Satellites

This shows the current satellites that are being used.

Settings—GPS Menu

GPS Menu—GPS Settings



- **Leave defaults alone unless directed by a technician.**

Definitions:

VDOP: The Vertical Dilution of Precision. Default is 3

Diff Age: Differential Age is the age of the corrections in seconds that the GPS was received from the base station.

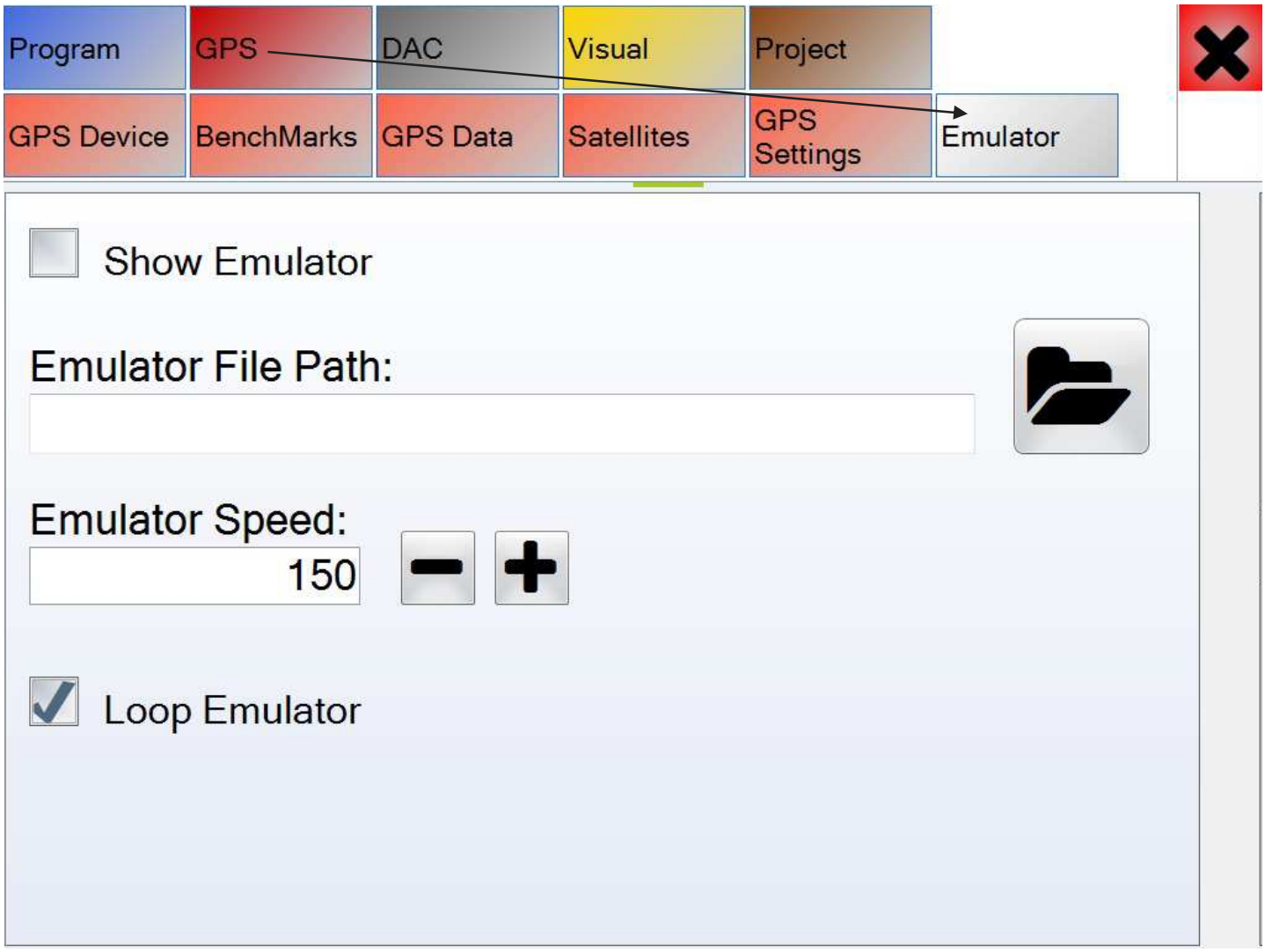
Fix Quality: Quality of the GPS needed to work. RTK Fixed should always be used; all others will be less accurate. RTK Float would be for corrected GPS but not as accurate as RTK. GPS fix is for WAAS GPS. Simulated- used in office or demo.

Hor. Error: Horizontal error of the GPS messages. Default is .1

Vert. Error: Vertical error of the GPS messages. Default is .1

Settings—GPS Menu

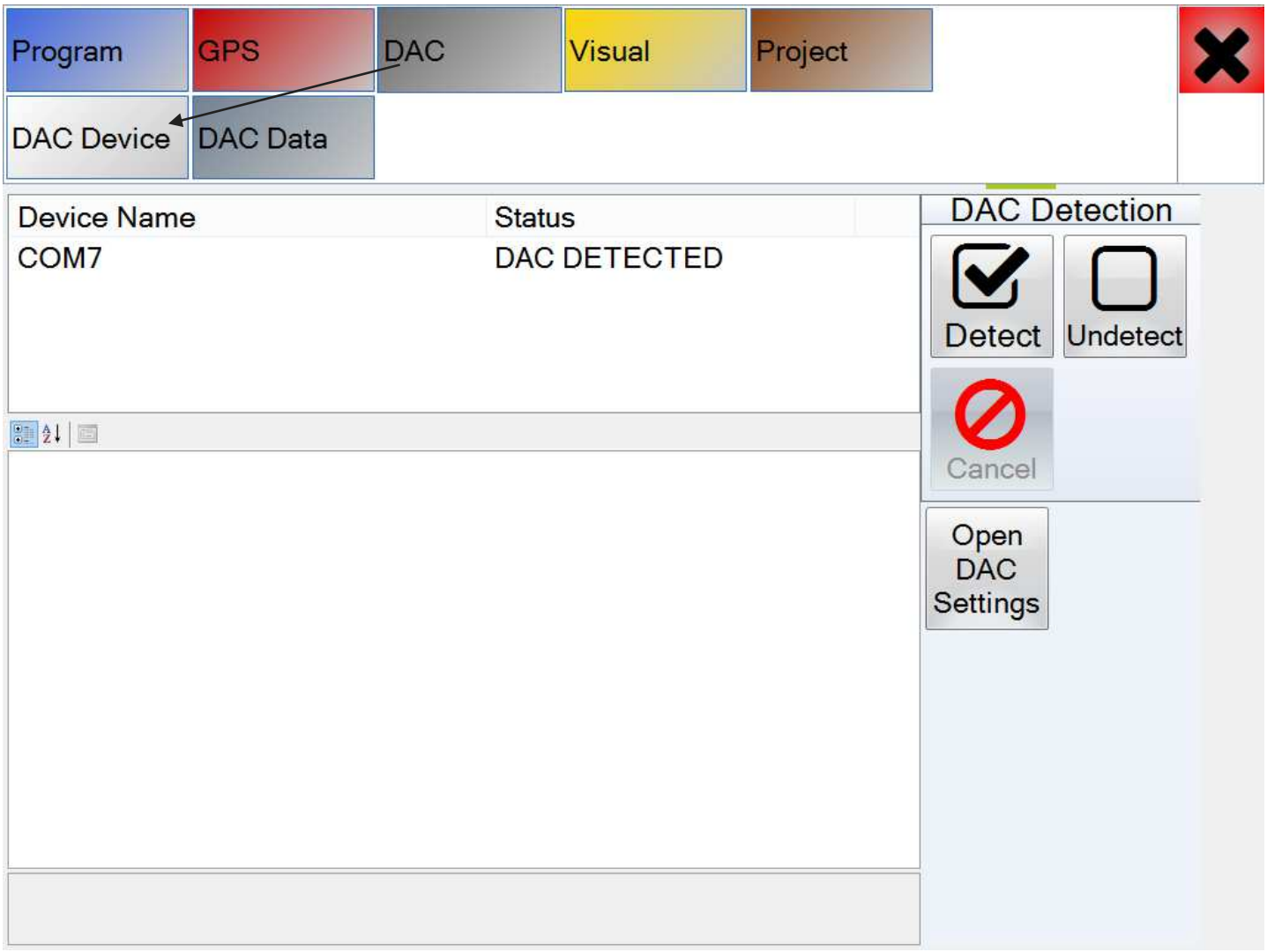
GPS Menu—Emulator



The Emulator is for playing back runs.

Settings—DAC Menu

DAC Menu—DAC Device

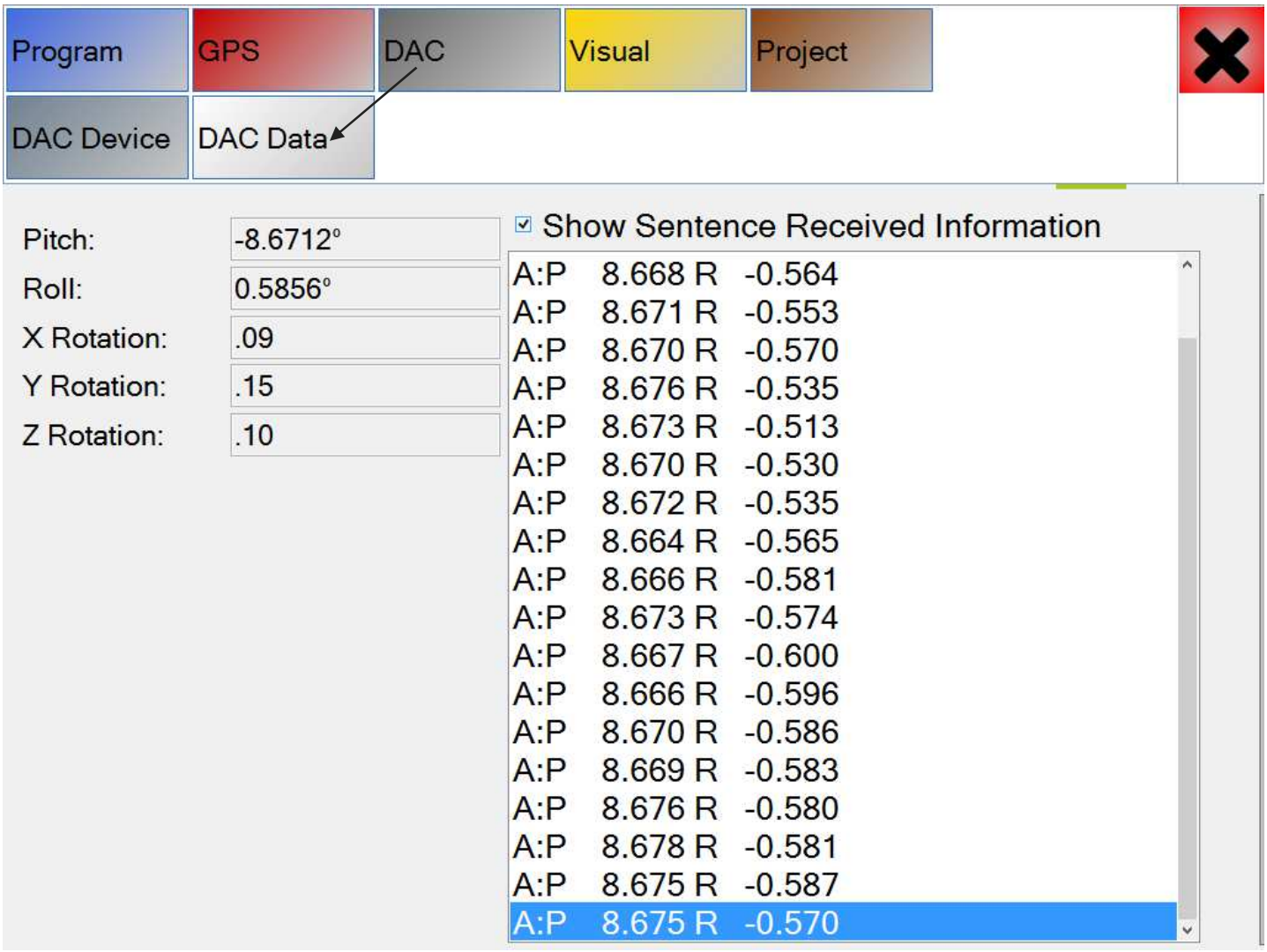


Select **Detect** to find the DAC 7000 on the COM port that it is plugged into.

For tuning, select **Open DAC Settings**.
**See your 2015 DAC Installation & Tuning Manual for more instructions.*

Settings—DAC Menu

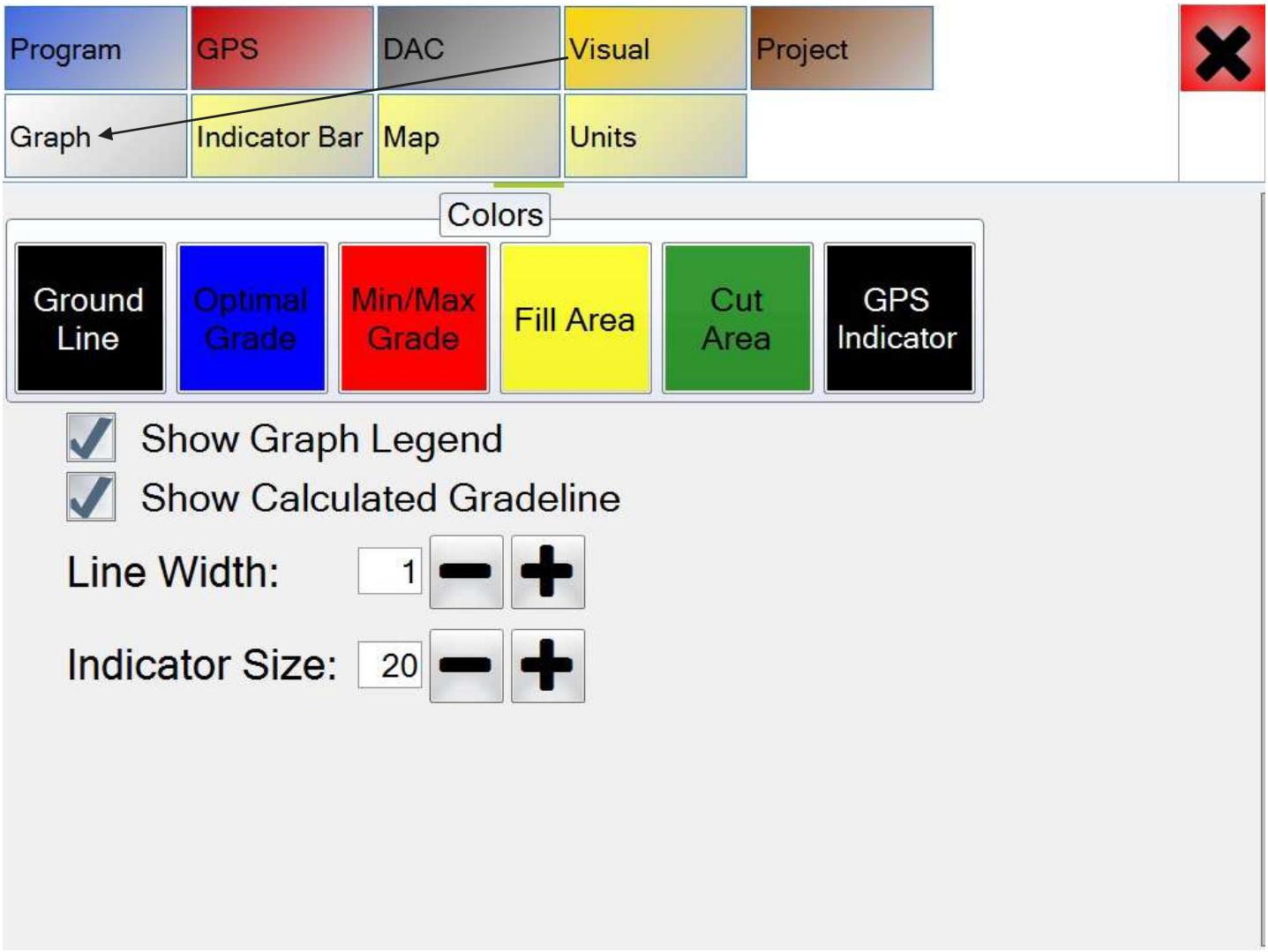
DAC Menu—DAC Data



Shows pitch and roll information if a slope sensor is connected.

Settings—Visual Menu

Visual Menu—Graph



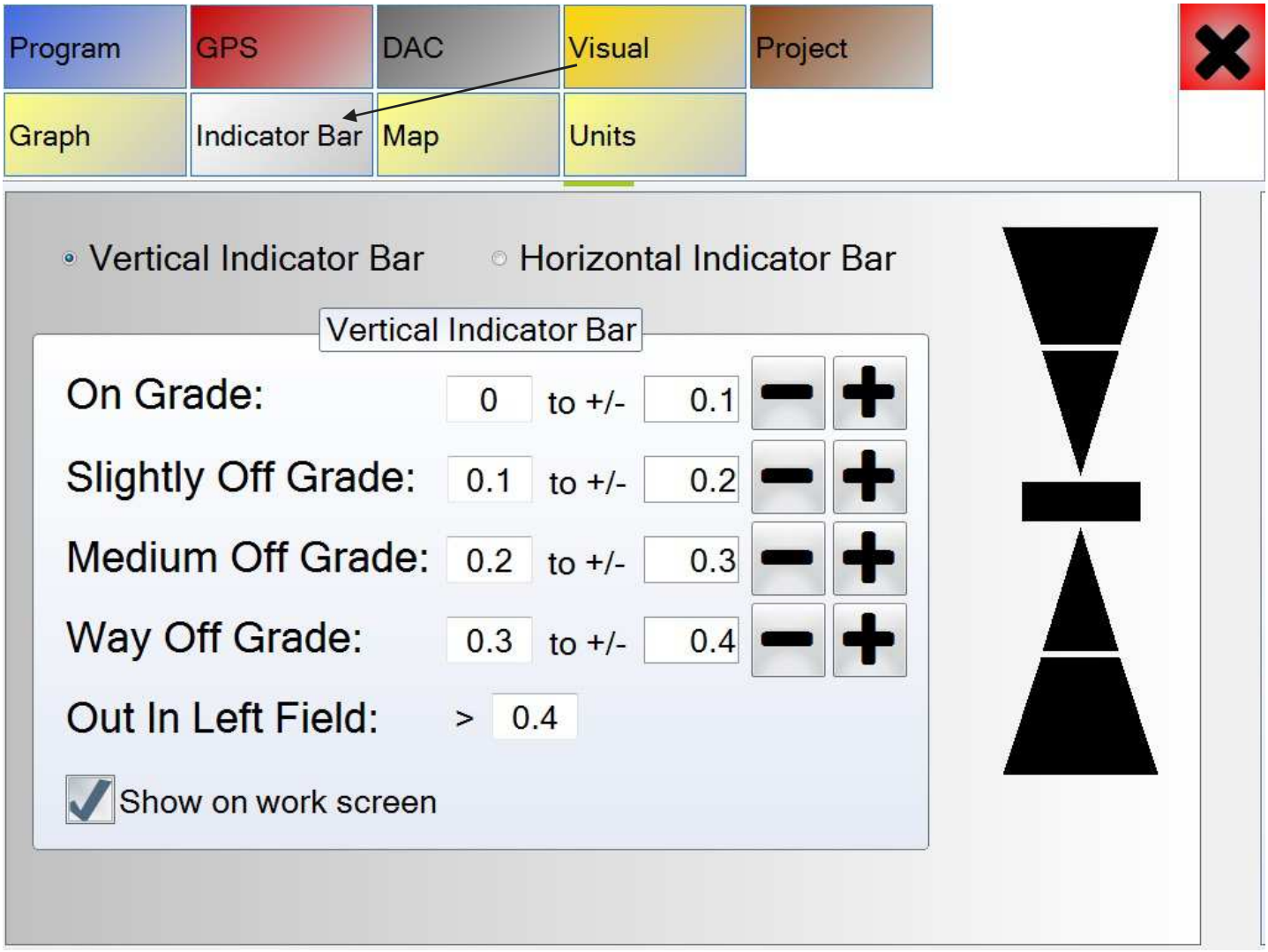
Definitions:

Colors that can be chosen for the side view cutting screen.

Show Graph Legend: Ability to take off the legend on the side view cutting screen
Show Calculated Gradeline: Shows the next cut for the gradeline
Line Width: Size of the grade line
Indicator Size: Size of the indicator on the Graph screen

Settings—Visual Menu

Visual Menu—Indicator Bar

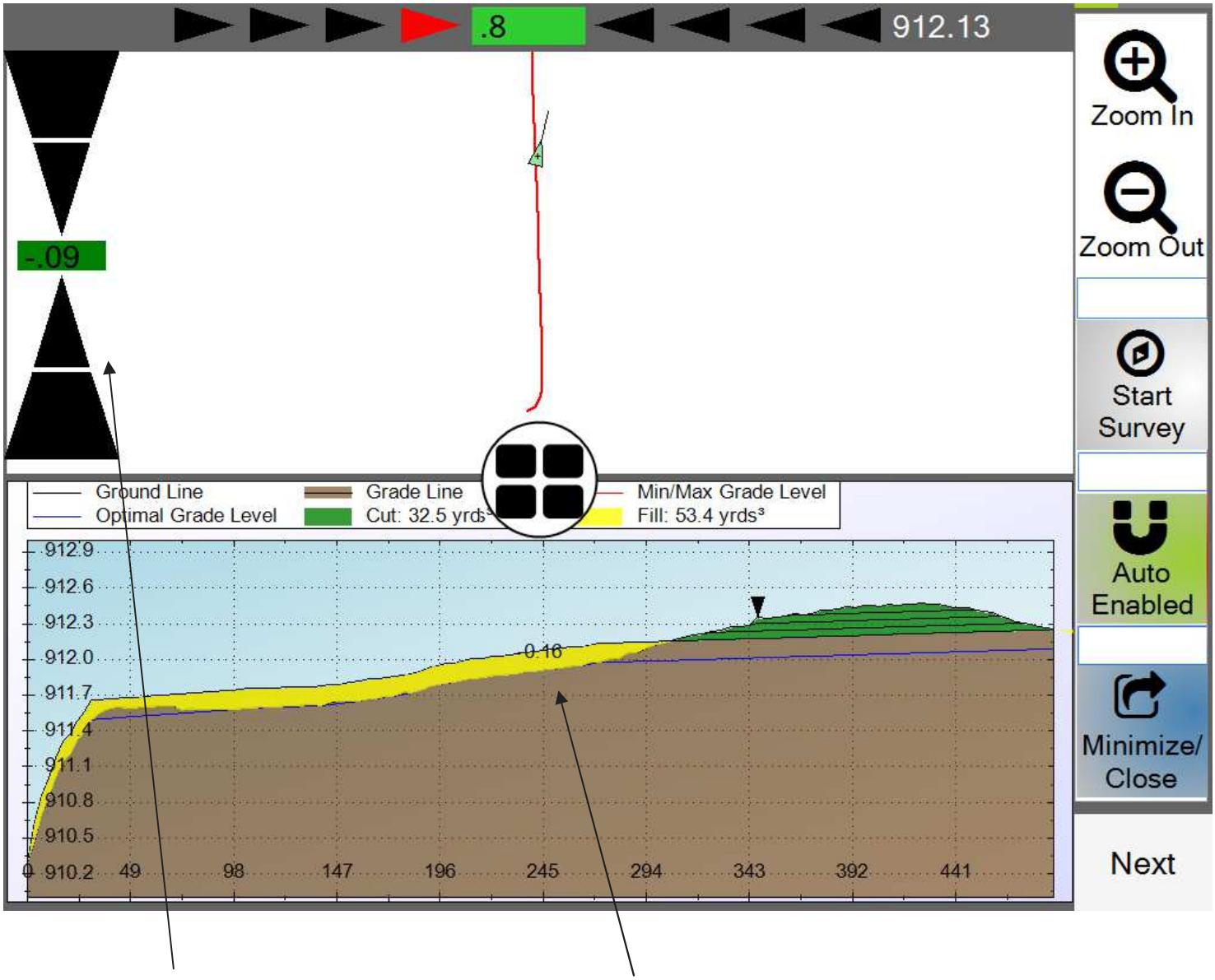


The vertical side bar on the main screen will allow the user to nudge up/down (+/-) from the proposed cut. See next page for more info

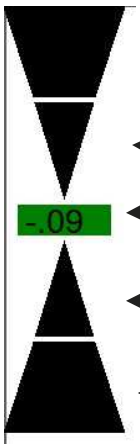
The Horizonal top bar is for steering guidance side to side

If the user does not want to view the horizontal or vertical bar on the main screen, make sure the check mark is <u>not</u> checked in the “Horizontal Bar Visible” box (same with Vertical Bar Visible).

Settings—Visual Menu



The Vertical Bar has been used to bring this line up 0.16 feet in this example. This shows that the user can move the line up for down to cut less or more to get the desired depth of this ditch.



This can be touched to move the grade line 0.2 feet down.

This can be touched to move the grade line 0.1 feet down.

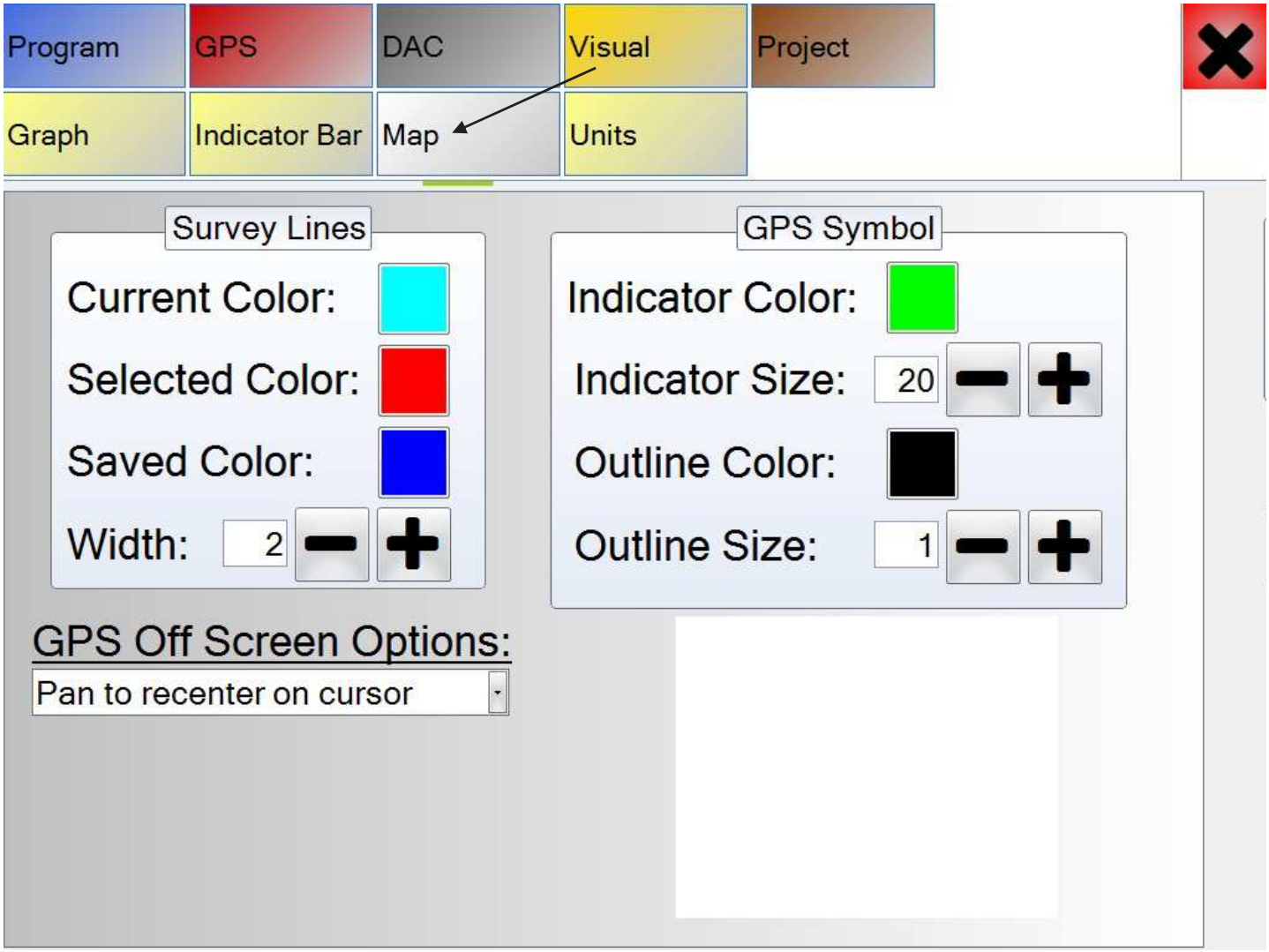
The center shows where the blade should be.

This can be touched to move the grade line 0.1 feet up.

This can be touched to move the grade line 0.2 feet up

Settings—Visual Menu

Visual Menu—Map



Definitions:

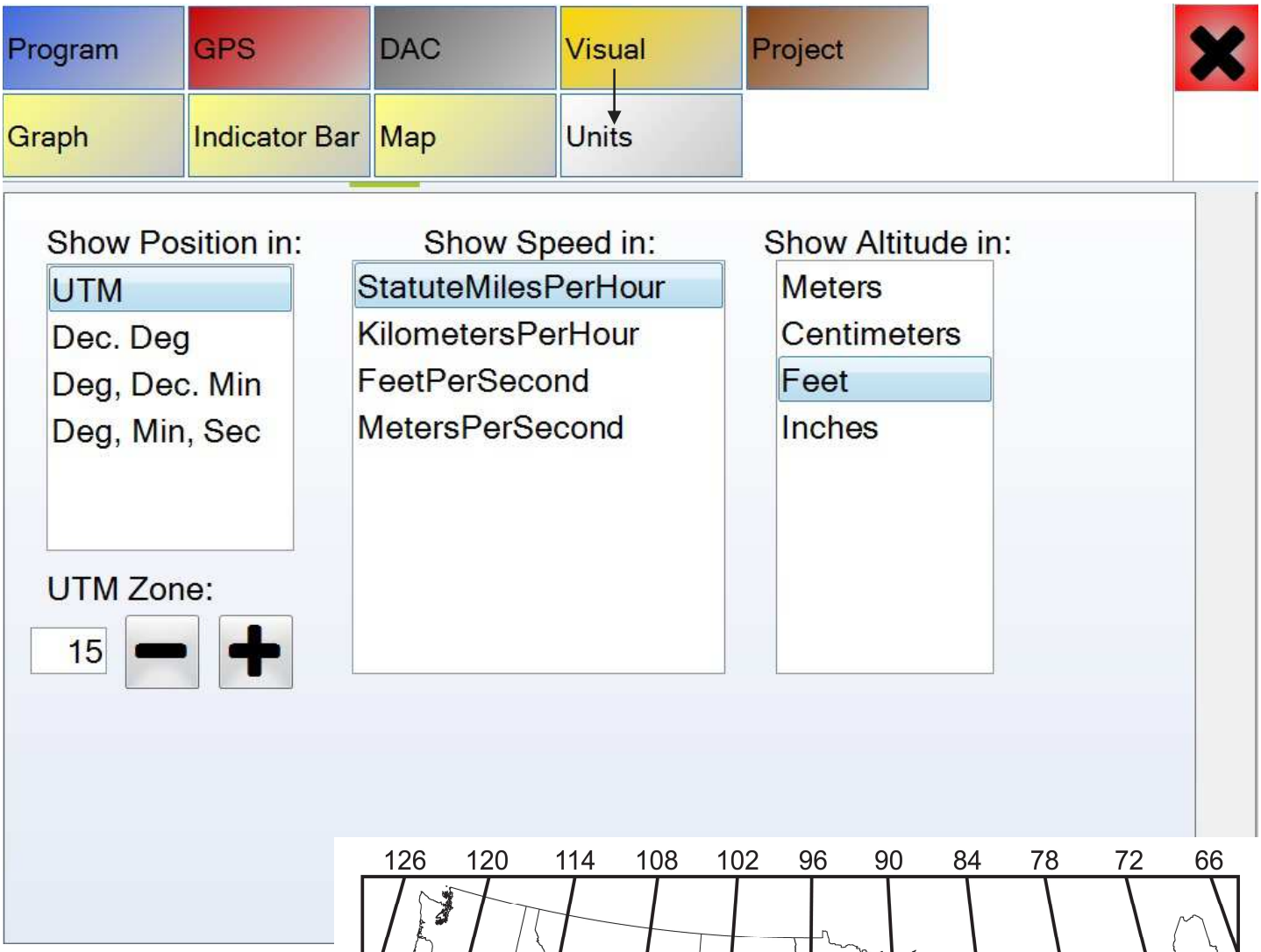
Survey Lines: These are shown in the Overhead Map

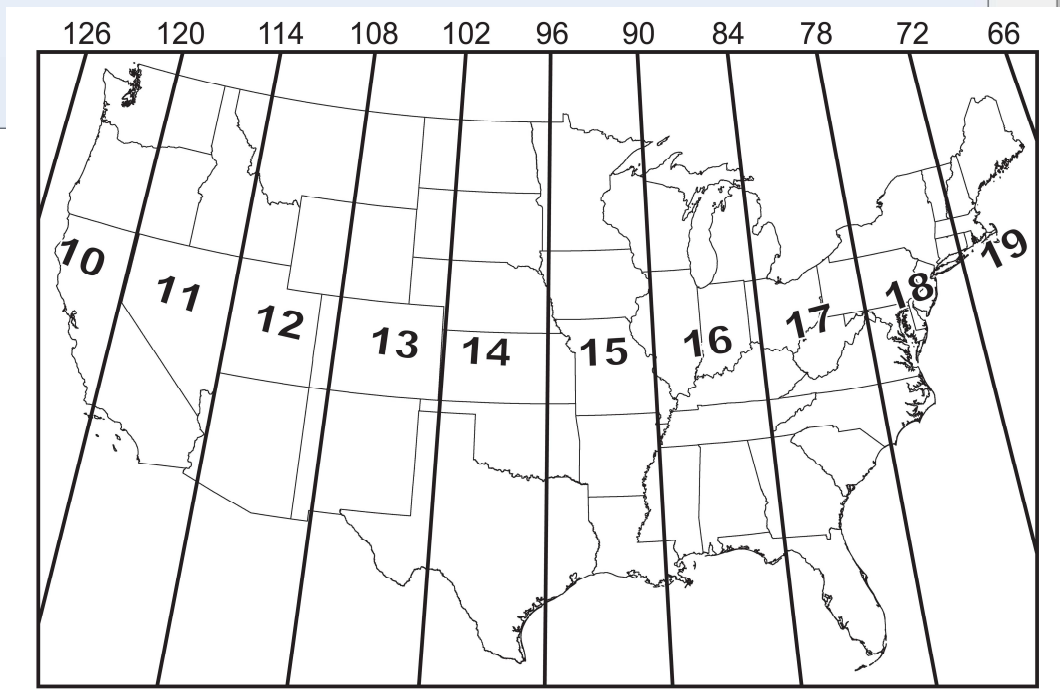
- **Current Color:** Color that the current ditch is being worked on
- **Selected Color:** Color that the current ditch is selected
- **Saved Color:** Color of all the saved ditches in the overhead map
- **Width:** Size of the ditch in the overhead map screen

GPS Symbol: Size and color the implement should be on the screen.

Settings—Visual Menu

Visual Menu—Units





Show Position In:
UTM;
Decimal Degrees;
Degrees, Decimal Minute;
Degrees, Minute, Seconds

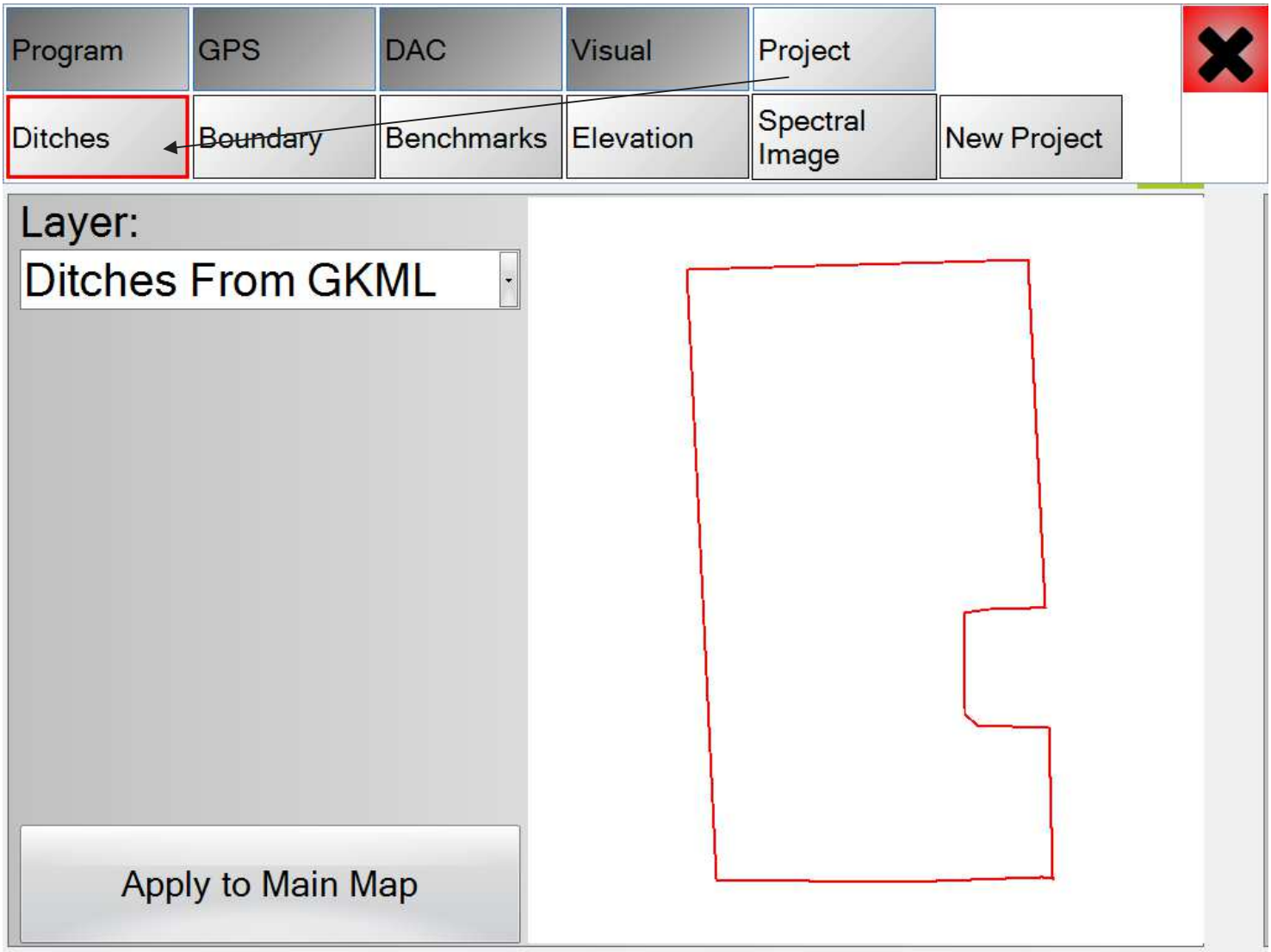
Select UTM Zone if that is selected.

Show Speed in:
Miles Per Hour

Show Altitude in:
Feet or Inches or Meters

Settings—Project Menu

Project—Ditches

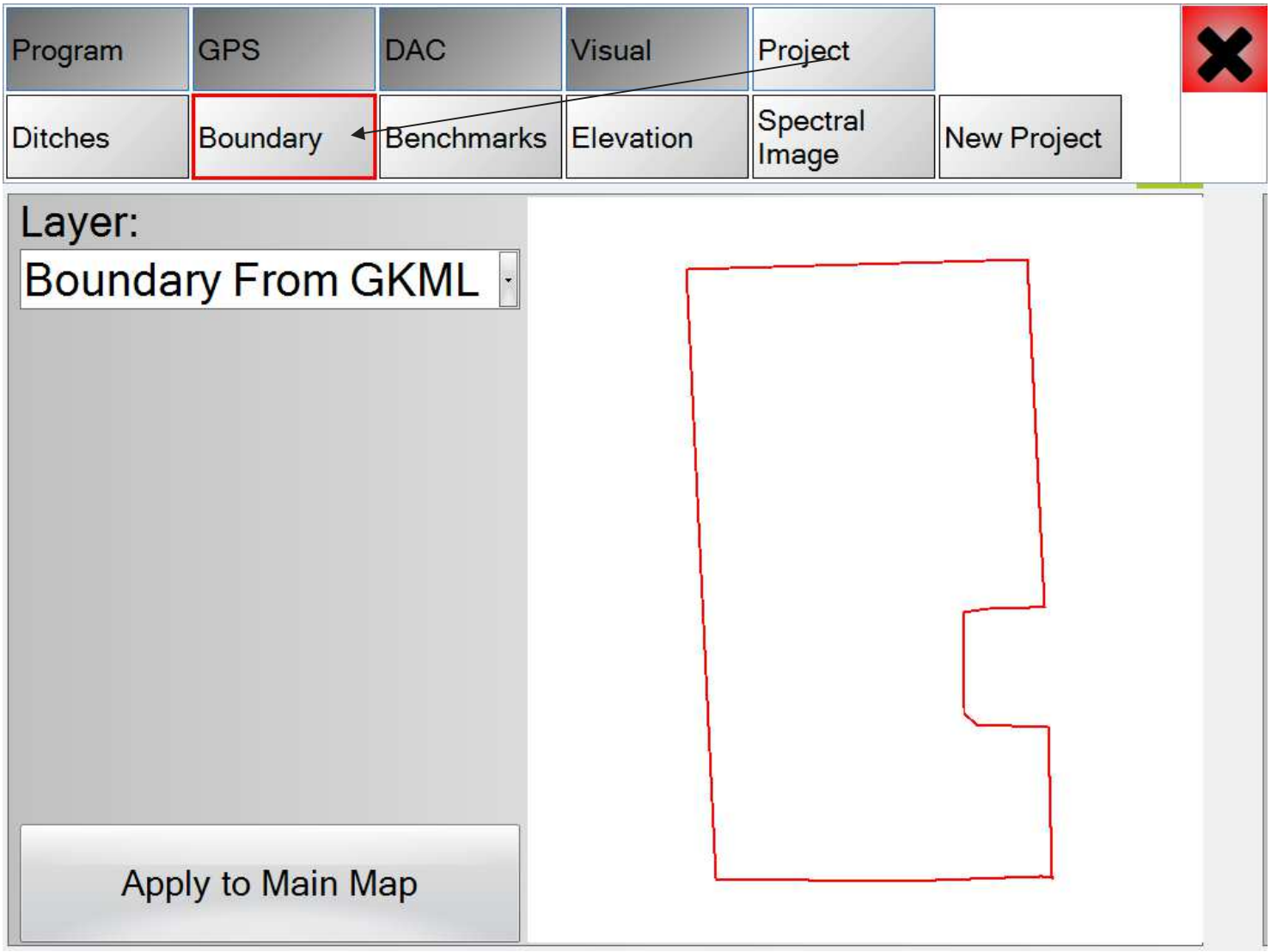


- This is where you would change the files used for Ditch mapping.

* Note: These files are imported data files from previously designed projects in Ag Data Mapping Solution

Settings—Project Menu

Project—Boundary

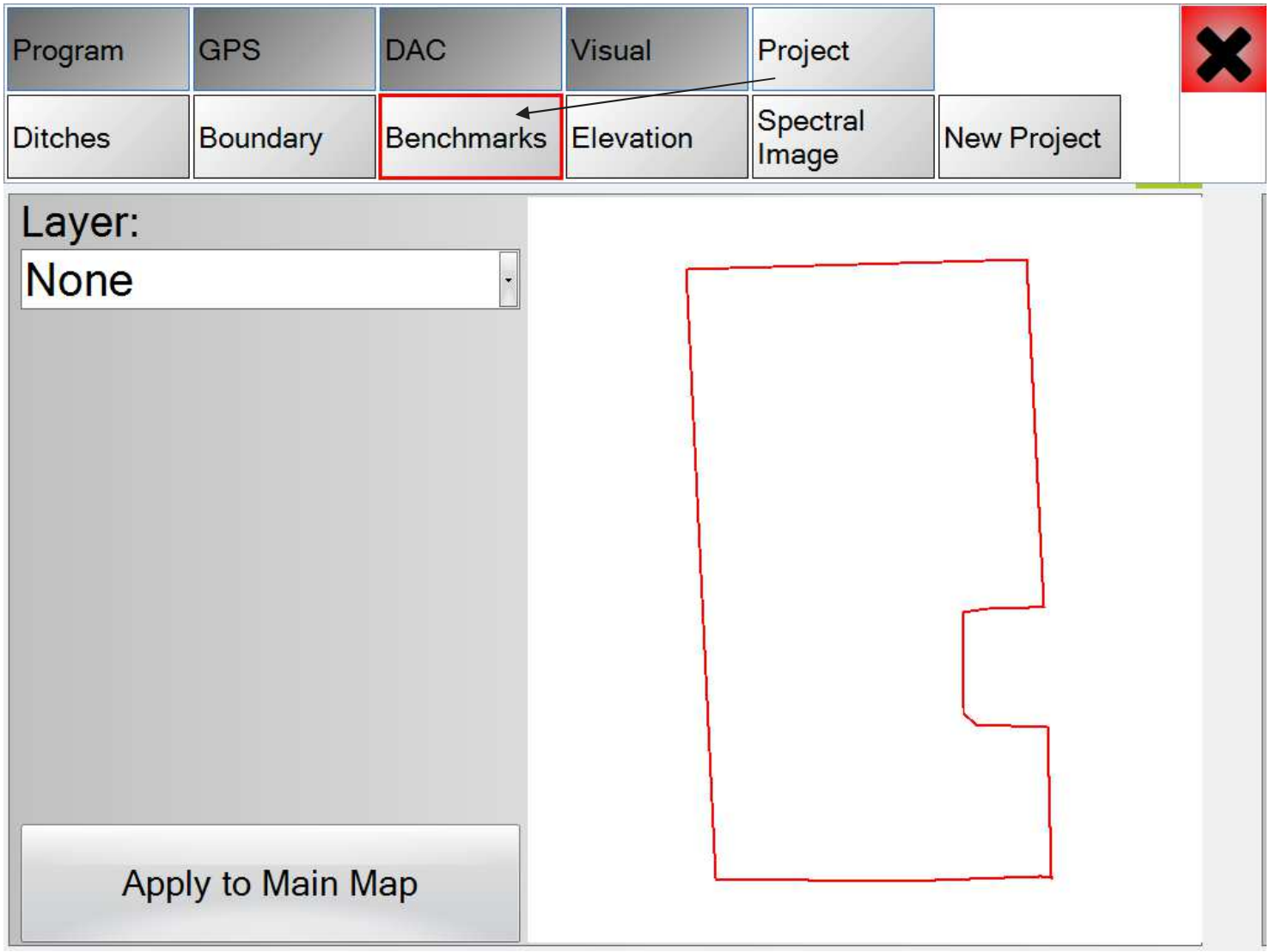


- This is where you would change the files used for Boundary mapping.

* Note: These files are imported data files from previously designed projects in Ag Data Mapping Solution

Settings—Project Menu

Project—Benchmarks

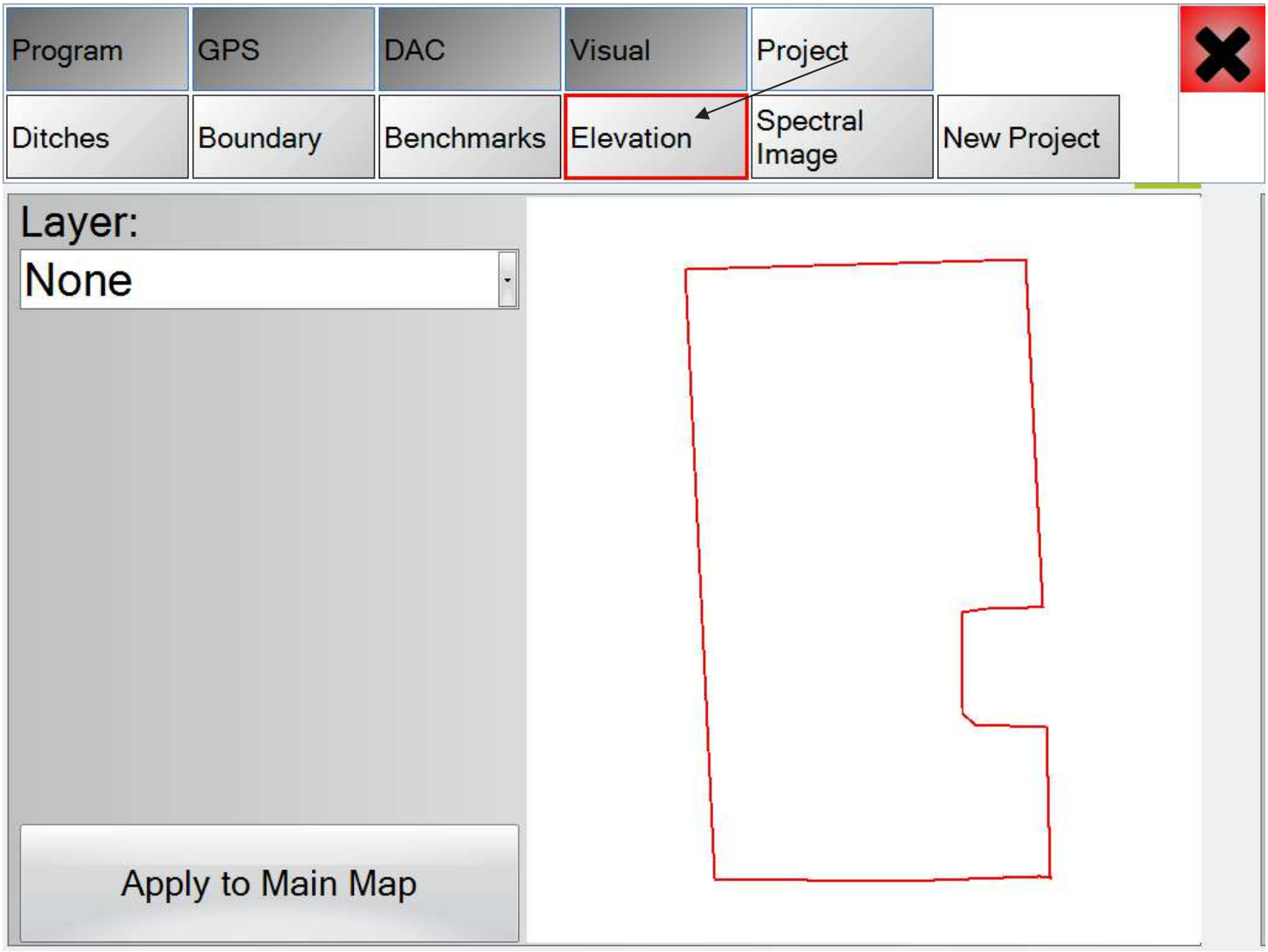


- This is where you would change the files used for Benchmarks

* Note: These files are imported data files from previously designed projects in Ag Data Mapping Solution

Settings—Project Menu

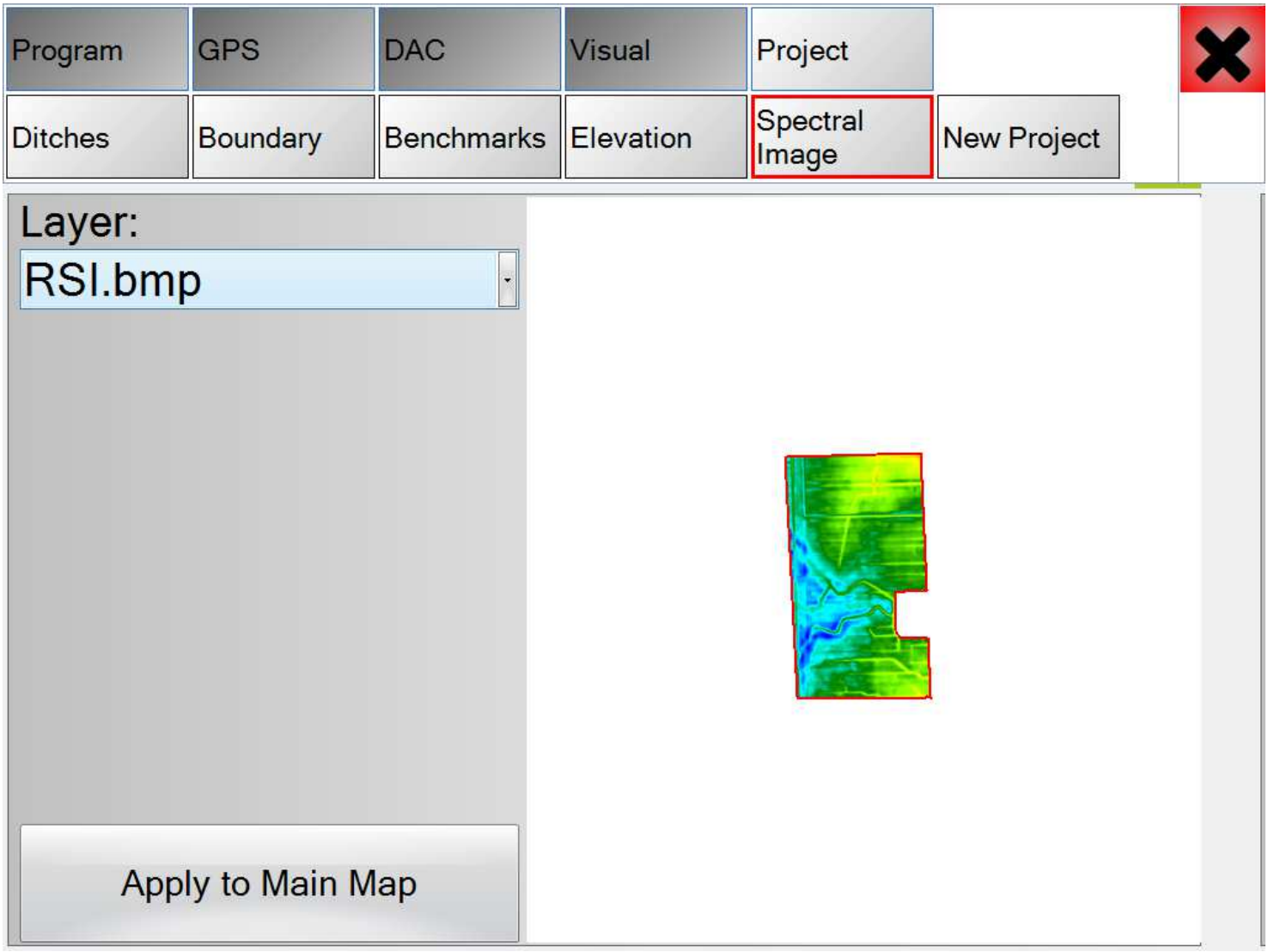
Project—Elevation



- This is where you would change the files used for Elevation mapping.
- Note: These files are imported data files from previously designed projects in Ag Data Mapping Solution
- This would be a elevation map showing topography

Settings—Project Menu

Project—Spectral Image



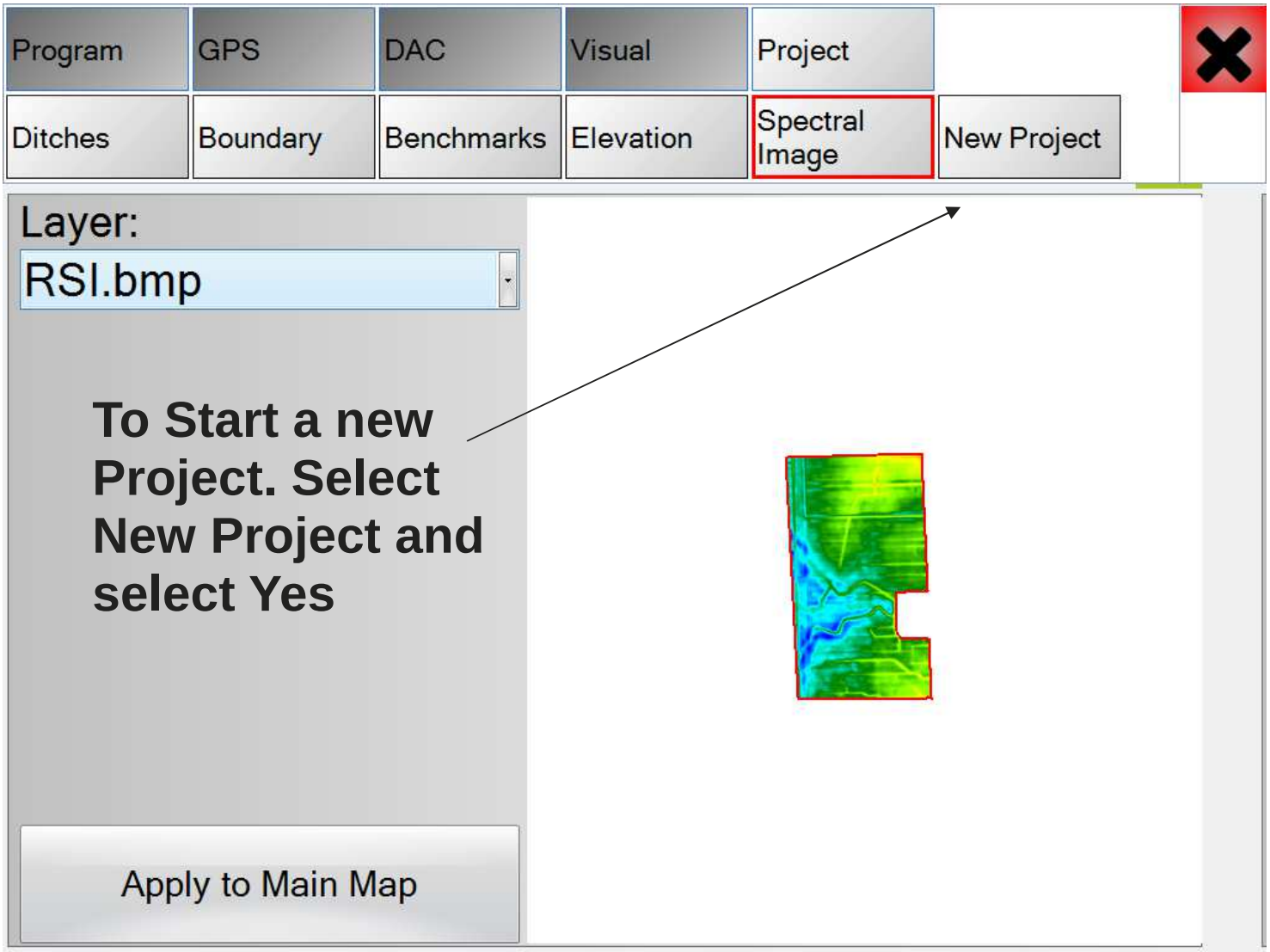
Backround images or Spectral Images can be added here. Put Desired image in the correct Grower, Farm Field in the folder C:Drive– GKData-Grower-Farm-Field

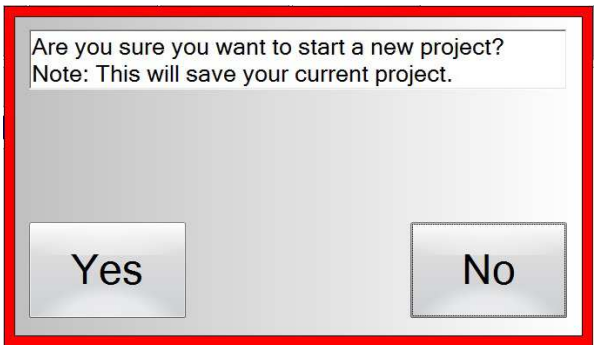
Sample of image- RSI.bmp & RSI.bpw

Contact your Dealer for additional information.

Settings—Project Menu

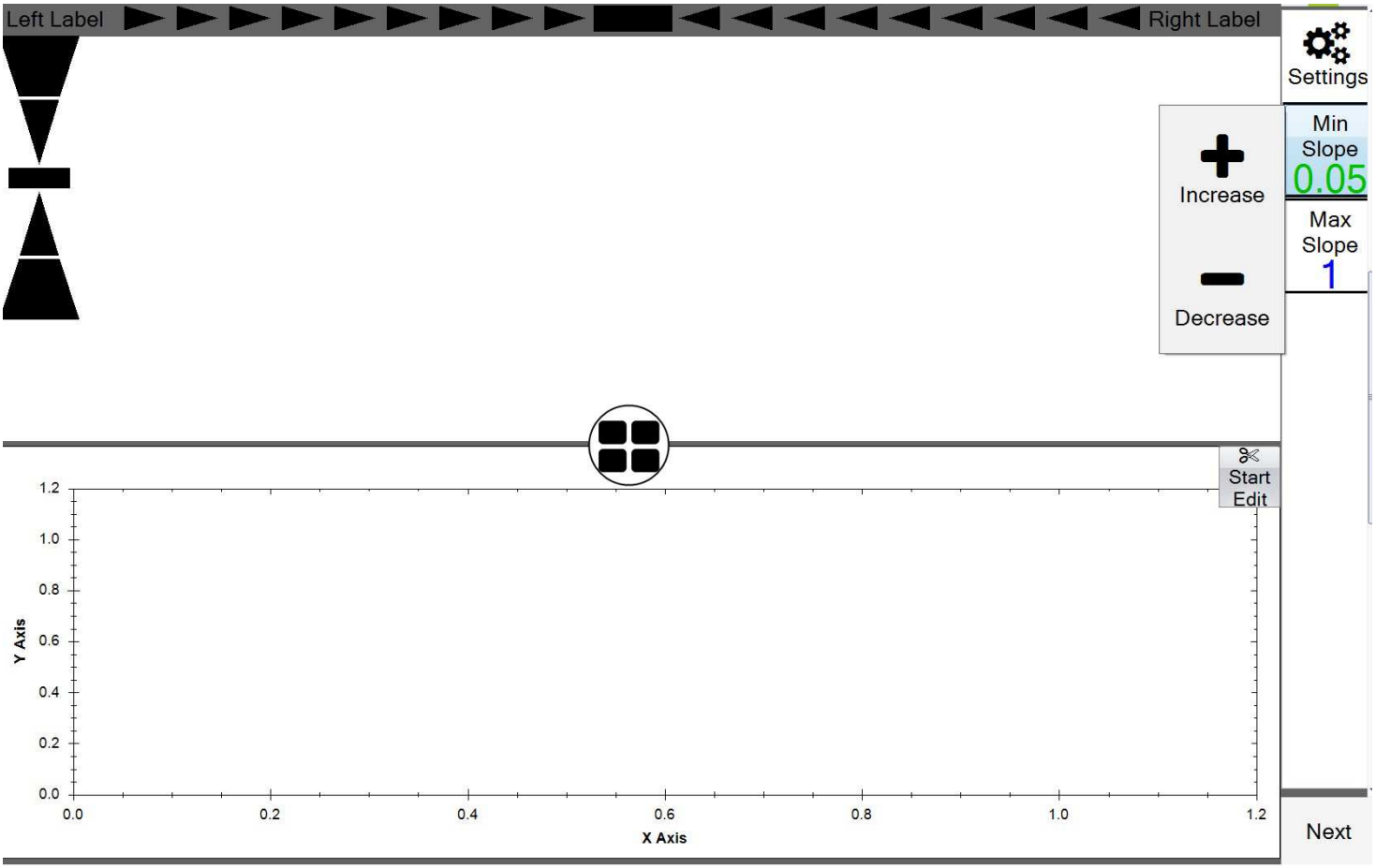
Project—New Project





Slope Settings

Slope Settings



Change these **<u>before</u>** cutting the dirt.

Definitions:

Min Slope:

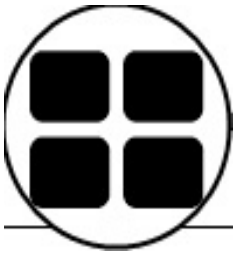
Touch the **Min Slope** Button, then:
Touch **+** to increase Minimum Slope
Touch **–** to decrease Minimum Slope

Max Slope:

Touch the **Max Slope** Button, then:
Touch **+** to increase Max Slope
Touch **–** to decrease Max Slope

Select **Next Page** button to move to the next set of quick access buttons.

Window Button

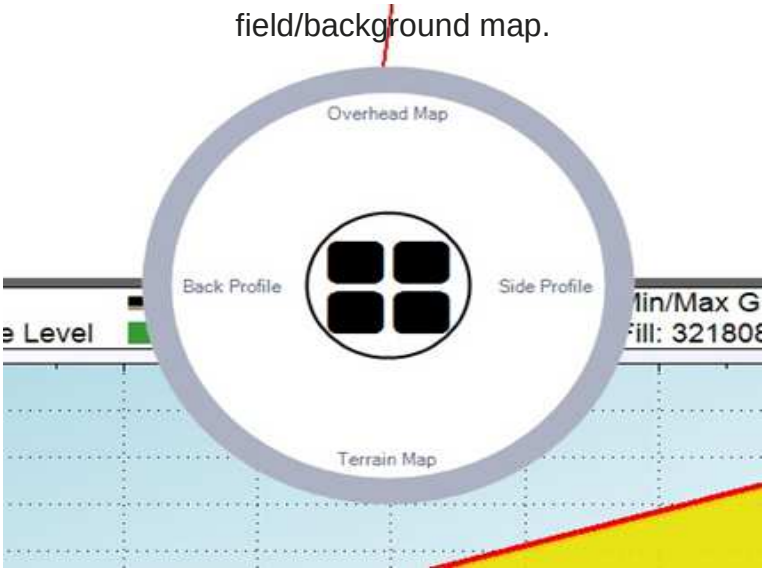


Window Button

Window Button:
Touch the window button and the 4 options come up

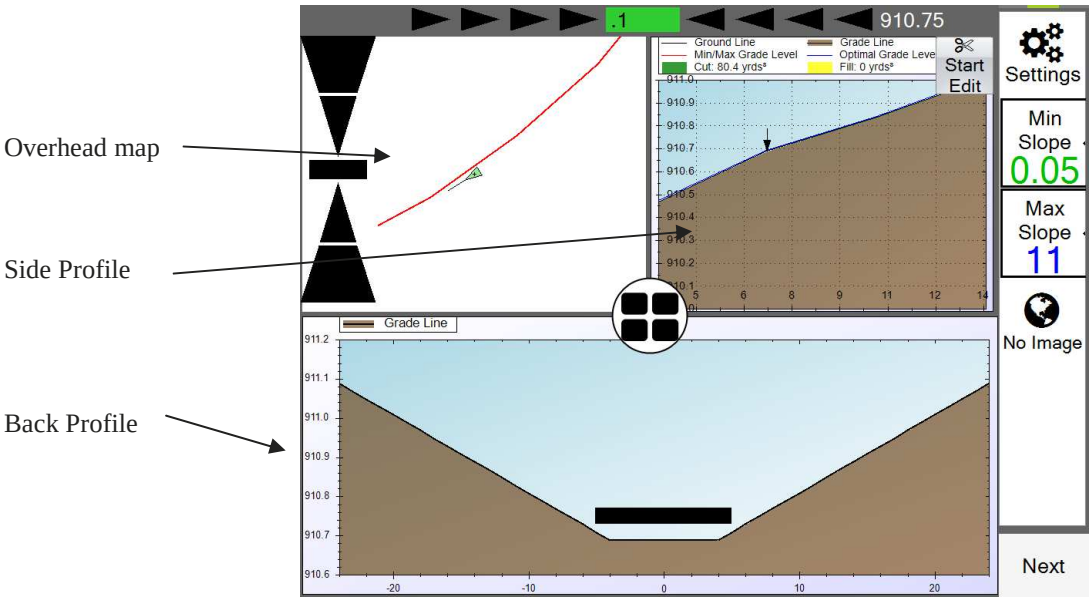
Overhead Map:
Turn this on or off to show the whole field/background map.

Back Profile:
This graph will show how the backslope feature is working. This will show a cross sec-



Side Profile:
Touch the button to turn this off or on. This will show the cut screen

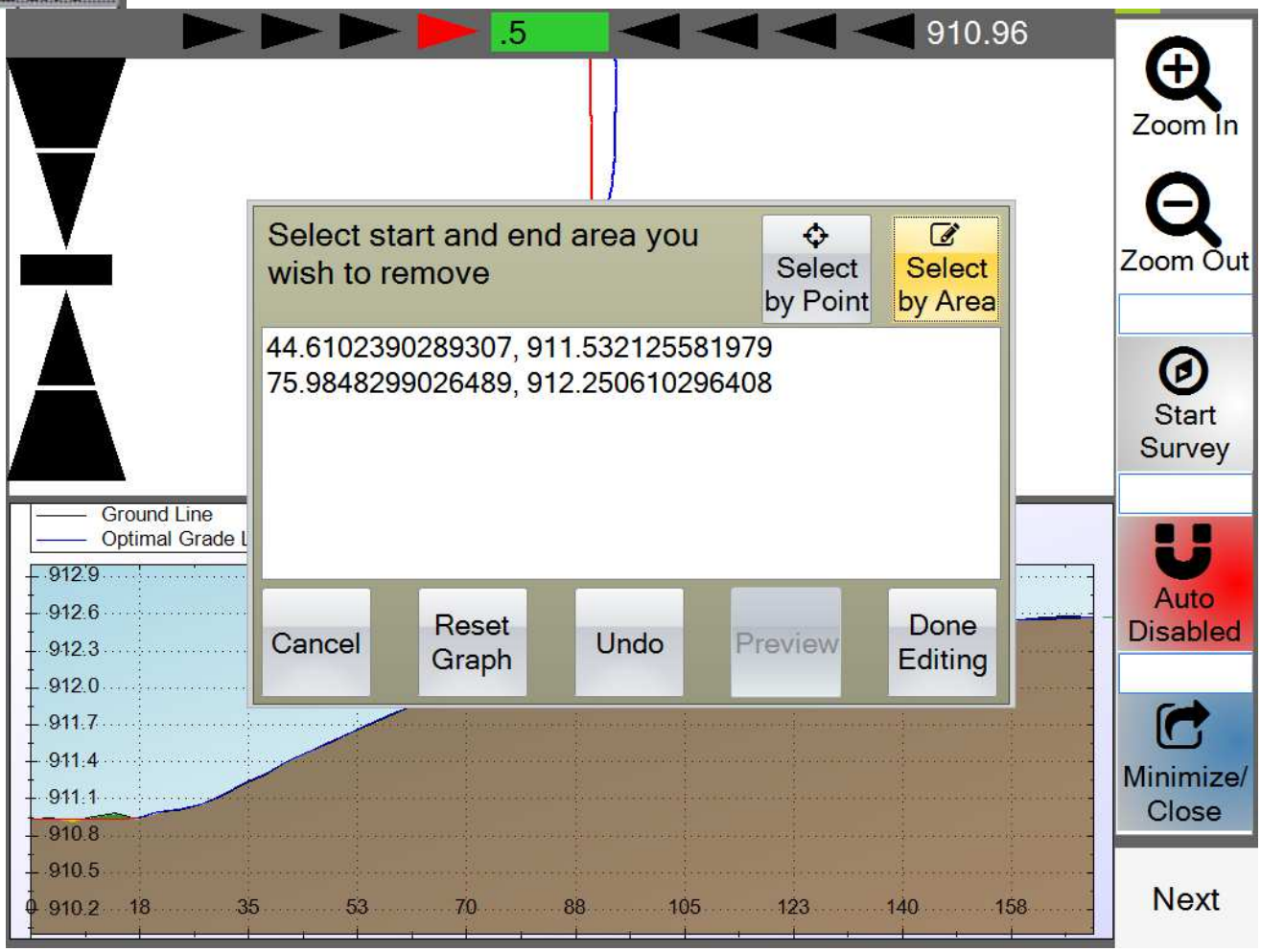
Terrain Map:
A Map designed in 3D. This will only work if you imported survey data for this job.



Start Edit Button

Editing a Survey

Start Edit: This feature will allow you to remove points from the survey line. This will help if you accidently drove too far or over a big rock, etc.



To Edit , Select by Point and select a specific point on the graph or Select by Area and select a area that should be removed.

Definitions:

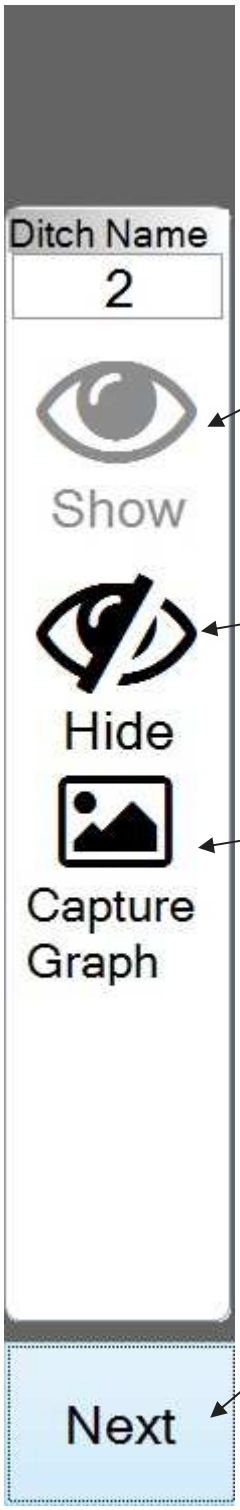
Cancel: This will cancel any edit.
Reset Graph: This will reset the graph to what it was without editing anything.
Undo: This will undo the last points you edited.
Preview: This will Show you what the graph will look like with the editing that was done.
Done Editing: This will save the points you removed and use the new graph for the cutting line.

Google Earth Import

To take the ditches that have been cut and apply them over a google earth image. Go to C Drive/ GKdata/ Grower/ Farm/ Field

Select the Drainage project and take the gkml file and change the extension to kml and then open it in google earth.

Quick Access Buttons Page 3



Show will allow the user to show a previously hidden ditch line. Select Show and select the line that you would like to show on the overhead view again.

Hide button- Touch the ditch on the screen that you would like to hide from the overhead view and then touch the hide button to hide the current ditch

Capture Graph- This will allow you to save the current side profile of any specific ditch to be able to view it later. It is just a screenshot of the side view. The captured graph will be stored in the c drive-gkdata -grower– farm-field-Profile

Select Next to go to the first set of quick access buttons.